# Table of Contents
# Division 900 - Miscellaneous

**HELPFUL WEBSITES** **3**

**D.O.T. AND OTHER IMPORTANT PHONE NUMBERS:** **4**

**HIGHWAY MAINTENANCE PHONE NUMBERS** **9**

**CONTRACTOR, SUPPLIER PHONE LIST** **14**
General Contractors 14
Subcontractors, Suppliers & Affiliates 14

**FORMULARS & CONVERSIONS** **18**
A. FORMULAS – AREAS & VOLUMES: 18
B. FORMULAS – TRIANGLES: 22
C. CONVERSIONS - SLOPE: 24
D. CONVERSIONS – GENERAL: 25

**GENERAL RULES** **28**
1. Rules for Writing Metric Symbols and Names 28
2. Rules for Writing Numbers 28
3. Soft vs. Hard Conversions 29
4. Basis of Conversion 30

**MISCELLANEOUS CONVERSIONS:** **31**
1. Conversions for Digitizing Plans and Cross Sections: 31
2. Pavement Unit Weights: 32
3. Application Rate for Emulsified Asphalt for Tack Coat: 32
4. Guardrail Warrants Based on Slope and Height of Embankment Only: 32
5. Significant Temperatures: 32

**FIELD LAYOUT & MEASUREMENT:** **33**
1. One Person Method of Measuring Drives, Approaches, and Ditches: 33
2. Steel Tape Temperature Corrections: 33
3. Determining Radii of Sharp Curves by Field Measurements 34
4. PAY LIMITS – COMMON EXCAVATION: 35
5. PAY LIMITS – STRUCTURE EXCAVATION: 36

**GEOMETRICS** **40**
A. GEOMETRICS - MISCELLANEOUS: 40
1. Permanent Lane Drop Tapers: 40
2. Vertical Clearances: 40
3. Parking Spaces: 41

B. GEOMETRICS - HORIZONTAL CURVES: 41
C. GEOMETRICS - VERTICAL CURVES: 44
D. GEOMETRICS – PARKING LOT LAYOUT: 49

**WEIGHTS OF MATERIALS: 51**

**BEARING CAPACITIES: 52**

**TRAFFIC CONTROL CHECKLIST: 53**

**ACCIDENTS - EMERGENCY NOTIFICATION PROCEDURE: 56**

**ACCIDENTS – ACCIDENT REPORT REQUEST: 57**

**SAFETY CONCERNS – CONSTRUCTION SITE HAZARDS: 58**

**OSHA REQUIREMENTS: 59**

**DRIVEWAY STATUTE: 61**

**JURISDICTION STATUTES: 62**

**HAZARDOUS WASTE MANIFEST: 64**

**FUEL DISTRIBUTION - FUELING SITE LOCATION LIST: 66**

**FUEL DISTRIBUTION - USER GUIDE: 67**

# HELPFUL WEBSITES

| | |
|---|---|
| AASHTO | www.transportation.org |
| AGC - Associated General Contractors' Phone List | http://www.agcnh.org/public/owners_guides/find_contractor/membership_list.asp |
| E.P.A. - Notice of Intent (N.O.I.) Receipt & Approval | http://cfpub.epa.gov/npdes/stormwater/noi/noisearch.cfm |
| FHWA | http://safety.fhwa.dot.gov |
| MSDS Information | www.msds.com |
| MUTCD-Manual of Uniform Traffic Control Devices | http://mutcd.fhwa.dot.gov |
| NHDOT E-mail Access via Microsoft Outlook | http://dot.state.nh.us |
| NHDOT Home Page | http://www.nh.gov/dot/index.htm |
| NHDOT Interdepartment Phone List | http://webster.state.nh.us/dot/contactus.htm |
| OSHA | www.OSHA.gov |
| Pile Driving Equipment Info.<br><br>Qualified Products List<br><br>Weighted Average Unit Prices | http://web.pile.com/pdi/products/grlweap/hammer.asp?company=<br><br>http://www.nh.gov/dot/materialsandresearch/pdf/apl.pdf<br><br>http://webster.state.nh.us/dot/highwaydesign/pdf/WeightedAveragesImperial.pdf |

# D.O.T. AND OTHER IMPORTANT PHONE NUMBERS:

| BUREAU | PHONE | FAX | CELL |
|---|---|---|---|
| **Administrative Services** | 3496 | | |
| **Aeronautics** | 2551 | 1689 | |
| **Archives** | 2236 | 2272 | |
| **Associated General Contractors** | 225-2701 | 226-3859 | |
| **Attorney Generals Office** | 3675 | 2110 | |
| **Bridge Design** | 2731 | 2759 | |
| **Bridge Maintenance** | 3667 | 1588 | |
| Principal Engineer (Ed Welch) | | | 419-9695 |
| Operations Engineer (Doug Gosling) | | | 419-9694 |
| Maint. & Constr. Engineer (Kyle Fox) | | | 419-9691 |
| Crew #1 – LANCASTER (Donald Allbee) | 788-2301 | | 419-0478 |
| Crew #2 – TWIN MOUNTAIN (Steve Canton) | | | 419-9506 |
| Crew #3 – NEW HAMPTON (Richard Green) | 863-3443 | Pager: 639-9008 | 419-0479 |
| Crew #4 – SUNAPEE | | | 419-0480 |
| Crew #5 – ALLENSTOWN (Dennis Marquis) | | | 396-4645 |
| Crew #6 – NEWFIELDS (Paul Spinney) | | Pager: 564-2573 | 396-4215 |
| Crew #7 – ANTRIM | 588-3365 | | |
| Crew #8 – CHICHESTER (James Mafera) | | | 396-6557 |
| Crew #10 – RUMNEY (Ed Bray) | | Pager: 639-8216 | 419-0482 |
| Crew #11 – EPPING (Eric Browser) | | | 396-4216 |
| Crew #12 & 15 – PORTSMOUTH OFFICE<br>Crew #15 – (Gene Popien) | 436-1099,<br>431-4132 | 436-3701<br>Pager: 639-8210 | <br>396-4644 |
| Crew #13 & 13B – FRANKLIN (Dan Gelinas) | | Pager: 639-3799 | 419-0483 |
| FRANKLIN YARD | 934-5735 | 934-3333 | |
| BAILEY YARD | 934-5429 | 934-3333 | |
| Crew #14 – BEDFORD (R. Thoroughgood) | | | 419-0484 |
| MEMORIAL BRIDGE (Portsmouth, Piscataqua River) | 436-3830 | Emergency Backup = | 419-9693 |
| SARAH MILDRED LONG BRIDGE (Portsmouth) | 436-2432 | Emergency Backup = | 419-9692 |
| HAMPTON DRAWBRIDGE* (Hampton River) | 926-3348 | | |
| INTERSTATE BRIDGE AUTHORITY (Portsmouth) | 436-2432 | | |
| RYE-NEW CASTLE BRIDGE* (Little Harbor) | 433-4654 | | |
| *Hampton & Rye-New Castle Bridges are operated by District 6. | | | |
| **Cafeteria** | 225-7868 | | |
| **Commissioner's/Directors' Offices** | 1484/1697 | 3914 | |

## D.O.T. AND OTHER IMPORTANT PHONE NUMBERS:

| BUREAU | PHONE | FAX | CELL |
|---|---|---|---|
| **Construction** | 2571 | 3461 | |
| Value Flex | 1-800-649-8452 | | |
| Allbright, Jeff | 2573 | | |
| Anderson, Peter (CMS) | 6122 | | |
| Bauer, Frank | 1544 | | 419-9340 |
| Bowles, Jim | 1587 | | 419-9531 |
| Flynn, Shaun | 1585 | | 419-0129 |
| Gola, Karen | 7052 | | 419-9524 |
| Metcalf, Paul | 1586 | | 419-9345 |
| Reimers, Dave | 1589 | | 419-9346 |
| **Contracts** | 3732 | 1558 | |
| Prequalification (Deb Weil) | 3402 | | |
| **DBE Program** | 6754 | | |
| **Deferred Compensation** | 225-8442 | | |
| **D.E.S.** | 3503 | 6588 | |
| **Engineering Audit** | 1556 | 2349 | |
| Administrator (Dennis Herrick) | 3463 | 2349 | |
| Shawn Murphy | 1608 | 2349 | |
| Sections (Al Cilley) | 8814 | 2349 | |
| | 5587 | 3461 | |
| **Environment** | 3226 | 7199 | |
| **Federal Credit Union** | 7731 | | |
| **F.H.W.A.** | 228-0417 | 228-2829 | |
| **Finance & Contracts** | 3466 | 2653 | |
| **Fuel Distribution** | 2056 | 6085 | |
| **GHRS Problems** | 3747 | | |
| **Help Desk** | 7555 | | |
| **Highway Design** | 2171 | 7025 | |
| Consultant Design | 1591 | 7025 | |
| Preliminary Design | 1596 | 7025 | |
| Final Design | 3252 | 7025 | |
| Conference Room | 2296 | | |
| **Survey** | 3192 | 7025 | |
| | | | |

## D.O.T. AND OTHER IMPORTANT PHONE NUMBERS:

| BUREAU | PHONE | FAX | CELL |
|---|---|---|---|
| **Highway Maintenance**** | 2693 | 6084 | |
| Maintenance Engineer (Caleb Dobbins) | | Pgr: 639-3305 | |
| Asst. Maintenance Engineer | | Pgr: 639-6906 | 419-0250 |
| **Permit Section / Lane Restrictions** | 2691 | 6084 | |
| DISTRICT ONE – Lancaster (Greg Placy) | 788-4641 | 788-4260 | Pgr: 549-5116 |
| DISTRICT TWO – Enfield (Alan Hanscom) | 448-2654 | 448-2059 | 252-6417 |
| DISTRICT THREE – Gilford (Mark Morrill) | 524-6667 | 524-8027 | 419-9410 |
| DISTRICT FOUR – Swanzey (Doug Graham) | 352-2302 | 352-7725 | 419-0400 |
| DISTRICT FIVE – Hooksett (Hiram Morrill) | 485-9526 | 485-9825 | 365-7028 |
| DISTRICT SIX – Durham (Doug DePorter) | 868-1133 | 868-5397 | 419-9557 |
| DISTRICT SIX Basement (Construction) | 868-6490 | | |
| **SEE SEPARATE SHEET FOR PATROL SHED NUMBERS | | | |
| **Human Resources** | 3734 | 8817 | |
| Insurance | 6611 | 8817 | |
| Labor Compliance | 6612 | 8817 | |
| External Labor Compliance: **Doug Potter** | 7424 | 8817 | 419-9391 |
| Payroll | 3492 | 8817 | |
| Postings | 2545 | 8817 | |
| Safety | 3491 | 3102 | |
| Security | 6977 | 8817 | |
| Training | 8026 | 8817 | |
| Worker's Comp | 8024 | 3102 | |
| **Information Technology Services (ITS)** | 3281 | 0385 | |
| **Lobby / Receptionist** | 3734 | 8817 | |
| **Materials & Research** | 3151 | 8700 | |
| Asphalt | 1663 | | |
| Chemistry Lab (paints, etc.) | 7932 | | |
| Concrete & Soils | 1656 | | |
| Concrete & Soils Lab (test results) | 1661 | | |
| Geology (blasting) | 1657 | | |
| Geotechnical | 1654 | | |
| Materials | 1545 | | |
| Research (Qualified Products List) | 1659 | | |
| Ride Quality (van, retroreflectivity) | 7655 | | |

## D.O.T. AND OTHER IMPORTANT PHONE NUMBERS:

| BUREAU | PHONE | FAX | CELL |
|---|---|---|---|
| **Mechanical Services (pool car requests)** | 3721 | 1649 | |
| GARAGES: | | | |
| Concord (Rick Preve) | 3611 | 1649 | |
| Center Ossipee | 539-4583 | | |
| Enfield | 448-4015 | | |
| Lancaster | 788-4177 | | |
| North Hampton | 964-6500 | | |
| Swanzey | 352-9102 | | |
| Twin Mountain | 846-5741 | | |
| **Municipal Highways** | 2107 | 6382 | |
| **OSHA** | 225-1629 | 225-1580 | |
| **OSHA Emergency #** | 1-800-321-OSHA (6742) | | |
| **Print Shop** | 3543 | | |
| **Public Information (Bill Boynton)** | 6495 | 3914 | |
| **Public Works** | 3516 | 3515 | |
| **Rail & Transit** | 2468 | 6767 | |
| **Records** | 3514 | | |
| **Retirement** | 3351 | | |
| **Right-of-Way** | 3222 | 6915 | |
| **Roadside Development** | 6476 | 7025 | |
| **Safety Officer** | 8023 | | |
| **S.E.A.** | 3411 | | |
| **State Police** (Accident Report Request) | 2128 | 1555 | |
| **Traffic Bureau** (See next page) | | | |
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## D.O.T. AND OTHER IMPORTANT PHONE NUMBERS:

| BUREAU | PHONE | FAX | CELL |
|---|---|---|---|
| **Traffic** | 2291 | 6083 | |
| Sign Shop | 2300 | 6083 | 419-0357 |
| Sign Supervisor, D-1 (Dave Byron) | | | 419-0358 |
| Sign Supervisor, D-2 (Donald Kibbee) | | Pgr: 771-8648 | 419-0359 |
| Sign Supervisor, D-3 (Loren Butmen) | | Pgr: 771-8630 | 419-0378 |
| Sign Supervisor, D-4 (David Nylen) | | Pgr: 771-8645 | 419-0385 |
| Sign Supervisor, D-5 (James Edmunds) | | Pgr: 771-8638 | 419-0384 |
| Sign Supervisor, D-6 (Paul Emerson) | | Pgr: 639-4169 | |
| Signal Shop | 2294 | 6083 | 419-0395 |
| Signal Repairman, Area 1 (Robert Foster) | | Pgr: 639-8243 | 419-0397 |
| Signal Repairman, Area 2 (William Taylor) | | Pgr: 639-8244 | 419-0396 |
| Signal Repairman, Area 3 (Dave Kirby) | | Pgr: 639-8245 | |
| **Transportation Planning** | 3344 | 8093 | |
| **Turnpikes**** | 485-3806 | 485-2107 | |
| **SEE SEPARATE SHEET FOR PATROL SHED AND TOLL BOOTH NUMBERS | | | |
| **Twin Mountain** | 846-5572 | 846-5047 | |
| **Utilities** | 3652 | | |
| **White Farm** | 3241 | | |
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# HIGHWAY MAINTENANCE PHONE NUMBERS

HEADQUARTERS – Concord (Phone: 271-2693, Fax: 271-6084)

## DISTRICT ONE - Lancaster (Phone: 788-4641, Fax: 788-4260)

| PATROL SHEDS: | PHONE |
|---|---|
| Columbia | 237-4904 |
| Crawford Notch | 278-5572 |
| Dixville | 255-9441 |
| Errol | 482-3249 |
| Franconia | 823-5516 |
| Franconia-Butterhill | 823-5338 |
| Glen | 383-9447 |
| Gorham | 466-2272 |
| Groveton | 636-2000 |
| Jefferson | 586-4329 |
| Lancaster | 788-4411 |
| Lincoln | 745-8933 |
| Lisbon | 838-6062 |
| Littleton | 444-5086 |
| Milan | 449-3332 |
| Pinkham Notch | 466-3832 |
| Pittsburg | 538-6610 |
| Twin Mountain | 846-5751 |
| West Milan | 449-6675 |
| Whitefield | 837-9106 |

| REST AREAS: | PHONE |
|---|---|
| Colebrook | 237-5390 |
| Littleton | 444-0125 |
| Shelburne | 466-2607 |

| GARAGES: | PHONE |
|---|---|
| Twin Mountain | 846-5741 |
| Whitefield | 788-4177 |

| MISC.: | PHONE |
|---|---|
| Littleton Sign Shop | 444-5690 |
| Twin Mountain Office | 846-5572 |

# HIGHWAY MAINTENANCE PHONE NUMBERS

HEADQUARTERS – Concord (Phone: 271-2693, Fax: 271-6084)

## DISTRICT TWO - Enfield (Phone: 448-2654, Fax: 448-2059)

| PATROL SHEDS: | PHONE |
|---|---|
| Andover | 735-5196 |
| Bristol | 744-3050 |
| Canaan | 523-4541 |
| Cornish | 675-2450 |
| Enfield | 448-1057 |
| Franklin | 934-5221 |
| Lebanon | 448-1349 |
| Lempster | 863-1577 |
| New London | 526-6409 |
| Newbury | 938-5340 |
| North Haverhill | 787-6332 |
| Orford | 353-4530 |
| Rumney | 786-9935 |
| Sunapee | 863-1140 |
| Wentworth | 764-5568 |

| REST AREAS: | PHONE |
|---|---|
| Springfield | 763-9684 |

| WEIGH STATION: | PHONE |
|---|---|
| Springfield | 448-2697 |

# HIGHWAY MAINTENANCE PHONE NUMBERS

HEADQUARTERS – Concord (Phone: 271-2693, Fax: 271-6084)

## DISTRICT THREE - Gilford (Phone: 524-6667, Fax: 524-6669)

| PATROL SHEDS: | PHONE |
|---|---|
| Alton | 875-2050 |
| Ashland | 968-3342 |
| Belmont | 267-6501 |
| Conway | 447-5783 |
| Freedom | 539-4551 |
| Loudon | 783-4219 |
| Meredith | 279-6943 |
| Moultonboro | 476-5777 |
| New Hampton | 744-8059 |
| Ossipee | 539-6852 |
| Tamworth | 323-7788 |
| Thornton | 726-8983 |
| Tilton | 267-7920 |
| Tuftonboro | 544-8391 |
| Wakefield | 522-3621 |

| REST AREAS: | PHONE |
|---|---|
| Conway | 356-3961 |
| Sanbornton | 264-4650 |

## DISTRICT FOUR - Swanzey (Phone: 352-2302, Fax: 352-7725)

| PATROL SHEDS: | PHONE |
|---|---|
| Alstead | 756-3607 |
| Charlestown | 826-5555 |
| Chesterfield | 363-4400 |
| Greenfield | 547-3302 |
| Greenville | 878-2318 |
| Hancock | 525-3705 |
| Hillsborough | 478-3328 |
| Hinsdale/Winchester | 336-5321 |
| Marlborough | 876-3984 |

| PATROL SHEDS (Cont'd): | PHONE |
|---|---|
| Marlow | 446-3362 |
| Nelson/Stoddard | 847-3419 |
| Rindge | 899-5537 |
| Swanzey | 352-6614 |
| Temple | 924-6956 |
| Troy | 242-6622 |
| Walpole | 445-5380 |
| Westmoreland | 399-4307 |

# HIGHWAY MAINTENANCE PHONE NUMBERS

HEADQUARTERS – Concord (Phone: 271-2693, Fax: 271-6084)

## DISTRICT FIVE - Hooksett (Phone: 485-9526, Fax: 485-9825)

| PATROL SHEDS: | PHONE | PATROL SHEDS (Cont'd): | PHONE |
|---|---|---|---|
| Allenstown | 485-5050 | Hollis | 465-2567 |
| Bedford | 669-5419 | Hooksett | 624-1441 |
| Bow | 224-0793 | Londonderry | 432-5976 |
| Candia | 483-8811 | Londonderry | 434-3103 |
| Canterbury | 783-4326 | Manchester | 622-1651 |
| Chester | 895-6153 | Milford | 673-3550 |
| Chichester | 798-5652 | Raymond | 895-3100 |
| Derry | 432-7921 | Salem | 898-9086 |
| Goffstown | 497-2471 | Warner | 456-2240 |
| Henniker | 428-7785 | Warner | 746-4223 |

## DISTRICT SIX - Durham (Phone: 868-1133, Fax: 868-5397)

| PATROL SHEDS: | PHONE | PATROL SHEDS (cont'd): | PHONE |
|---|---|---|---|
| Dover | 742-6738 | Newfields | 778-8876 |
| Epping | 679-5314 | North Hampton | 964-8886 |
| Exeter | 773-9937 | North Hampton/Rye | 964-6796 |
| Gonic | 332-7034 | Northwood | 942-5971 |
| Kingston | 642-5261 | South Kingston | 382-8014 |
| Lee | 868-5726 | Strafford | 664-9344 |
| Milton | 652-4521 | | |

# TURNPIKE MAINTENANCE PHONE NUMBERS

HEADQUARTERS – (Phone: 485-3806, Fax: 485-2107)

| PATROL SHEDS: | PHONE |
|---|---|
| Dover | 742-2887 |
| Hampton | 926-6862 |
| Hooksett | 485-3783 |
| Merrimack | 424-9249 |
| Nashua | 577-9141 |

| TOLL PLAZAS: | PHONE |
|---|---|
| Bedford | 647-2988 |
| Dover | 742-6804 |
| Hampton | 926-2560 |
| Hampton Ramp | 926-0438 |
| Hooksett | 485-9352 |
| Merrimack x10 | 889-2818 |
| Exit 11 | 424-6829 |
| Bedford Rd. No. | 429-3476 |
| Bedford Rd. So. | 429-3475 |
| Rochester | 332-2087 |

| INFORMATION CENTERS: | PHONE |
|---|---|
| Hooksett "S" | 485-3542 |
| Nashua | 882-0023 |
| Seabrook | 474-5211 |

# CONTRACTOR, SUPPLIER PHONE LIST

SOURCE: Associated General Contractor's Website –
http://www.agcnh.org/public/owners_guides/find_contractor/membership_list.asp

## AGC Contractor, Subcontractor & Supplier List

### General Contractors

| | | | |
|---|---|---|---|
| Baybutt Construction Corp. | Keene, NH | (603) 352-6846 | Building Contractor |
| Beacon-Skanska Construction Co. | Boston, MA | (617) 574-1400 | Building Contractor |
| **Beck & Bellucci, Inc.** | Franklin, NH | (603) 934-5236 | Bridge Contractor |
| Brox Industries | Dracut, MA | (978) 454-9105 | Highway Contractor |
| Cianbro Corporation | Pittsfield, ME | (207) 487-3311 | Heavy/Highway/Bridge/Marine |
| **Continental Paving, Inc.** | Londonderry, NH | (603) 437-5387 | Highway Contractor |
| **D.R. Key Corporation** | Lebanon, NH | (603) 448-3060 | Highway Contractor |
| **Evroks Corporation** | Winnisquam, NH | (603) 527-3545 | Heavy/Bridge Contractor |
| **F.W. Whitcomb Construction Corp.** | Walpole, NH | (603) 445-5555 | Highway/Bridge Contractor |
| Gilbane Building Co. | Manchester | (603) 669-0076 | Construction Manager |
| George R. Cairns & Sons, Inc. | Windham, NH | (603) 421-1888 | Heavy/Highway Contractor |
| Harvey Construction Corp. | Bedford, NH | (603) 624-4600 | Building Contractor |
| H.E. Sargent, Inc. | Stillwater, ME | (207) 827-4435 | Highway Contractor |
| Ingram Construction Corp. | W. Swanzey, NH | (603) 357-0759 | Building Contractor |
| **J.G.E. Enterprises Inc.** | Manchester, NH | (603) 624-0338 | Highway Contractor |
| MacMillin Company, Inc. | Keene, NH | (603) 352-3070 | Building Contractor |
| **Morrill Construction Inc.** | No. Haverhill, NH | (603) 787-6955 | Heavy/Highway Contractor |
| **Park Construction Corp.** | Fitzwilliam, NH | (603) 585-6577 | Highway Contractor |
| Pike Industries, Inc. | Belmont, NH | (603) 527-5100 | Highway Contractor |
| Pro Con, Inc. | Manchester, NH | (603) 623-8811 | Building Contractor |
| **R.M. Piper, Inc.** | Plymouth, NH | (603) 536-4154 | Heavy/Highway Contractor |
| R.S. Audley, Inc. | Bow, NH | (603) 224-7724 | Heavy/Highway Contractor |
| **Severino Trucking Co., Inc.** | Candia, NH | (603) 483-2133 | Highway Contractor |
| SUR Construction, Inc. | Rochester, NH | (603) 332-4554 | Highway Contractor |
| **Weaver Brothers Construction Co.** | Concord, NH | (603) 228-8631 | Highway Contractor |
| **Virgin Construction Corporation** | W. Franklin, NH | (603) 934-3853 | Civil Contractor |
| **Winterset, Inc.** | Lyndonville, VT | (603) 626-9330 | Highway/Bridge Contractor |

### Subcontractors, Suppliers & Affiliates

| | | | |
|---|---|---|---|
| **ABC Flooring Specialists** | Manchester, NH | (603) 621-9774 | Flooring Supply & Installation |
| **Able Crane Service** | Merrimack, NH | (603) 424-9415 | Crane Service |
| **A.H. Harris & Sons, Inc.** | Portsmouth, NH | (603) 436-3833 | Concrete Supplies & Sealants |
| **Acadia Insurance Company** | Bedford, NH | (603) 627-8466 | Insurance/Bonding |
| **ADA Traffic Control** | Bridgewater, VT | (802) 672-5143 | Flagging Agency |
| **Alt. Communications Service Corp.** | Nashua, NH | (603) 882-3100 | Telephone System Design & Installation |
| **Alvin J. Coleman & Son, Inc.** | Conway, NH | (603) 447-5936 | Concrete, Sand & Gravel Supplier |
| **American Excavating Corporation** | Derry, NH | (603) 425-2256 | Sitework Contractor |
| **Andrews Construction Co., Inc.** | Campton, NH | (603) 726-7623 | Road, Site & Utility Contractor |
| Aspen Insurance Agency, LLC | Manchester, NH | (603) 647-0800 | Insurance, Bonds, & Employee Benefits |
| **Barker Steel Co.** | Lebanon, NH | (207) 883-3444 | Reinforcing & Structural Steel Supplier |
| **Bay Point Financial E-Mail** | Manchester | (603) 626-6699 | Financial Services |
| **Beauregard Equipment Co.** | Concord, NH | (603) 225-6621 | Equipment/Machinery Dealer |
| **Berry, Dunn, McNeil & Parker** | Lebanon, NH | (603) 669-7337 | Accounting/Financial Services |
| **Blaktop, Inc.** | West Lebanon, NH | (603) 298-8885 | Asphalt/Tar/Emulsions |
| **Brook Hollow Sand & Gravel Corp.E-Mail** | Bedford, NH | (603) 668-7933 | Supplier of Sand, Gravel, Aggregates & Loam |
| **Brown Engineering, LLC** | Pittsfield, NH | (603) 435-7022 | Civil Engineering, Land Surveying, & Construction Management |
| **Busby Construction Co. Inc.** | Atkinson, NH | (603) 362-4650 | Road, Site & Utility Contractor |
| **Capitol Fire Protection Co., Inc. E-Mail** | Loudon, NH | (603) 783-4713 | Fire Protection |
| **Carroll Concrete** | Newport, NH | (603) 863-1000 | Concrete Supplier |
| **Chadwick-BaRoss, Inc.** | Concord, NH | (603) 224-4063 | Equipment/Machinery Dealer |
| **Ciment Quebec, Inc. E-Mail** | Portsmouth, NH | (603) 498-4365 | Cement/Concrete Supplier |
| **Clark-Mortenson Agency, Inc.** | Keene, NH | (603) 352-2121 | Insurance Agency |
| **Clarke & Co. Earthwork Contractors** | Wilmot, NH | (603) 526-6404 | Excavation Contractor |
| **Classic Curb, Inc.** | Bow, NH | (603) 228-1922 | Curb Installation |
| **Cline Design** | Salisbury, NH | (800) 671-6477 | Design/Publishing Consultant |
| **Columbia Sand & Gravel** | Colebrook, NH | (603) 237-5729 | Sand & Gravel Supplier |
| **Concord Sand & Gravel** | Concord, NH | (603) 224-2146 | Sand & Gravel Supplier |
| **Construction Summary of NH** | Manchester, NH | (603) 627-8856 | Reporting Service |
| **Continental Placer, Inc.** | Laconia, NH | (603) 524-0811 | Engineering/Environmental Consultant |
| **Contractors Risk Management** | Concord, NH | (603) 225-3335 | Safety Consultant |

| | | | |
|---|---|---|---|
| CWS Fence-Guardrail | Andover, NH | (603) 735-5465 | Guardrail, Bridgerail, Snowfence, etc. |
| David W. Wood | Deering, NH | (603) 529-2355 | Copywriter/Publicist/Marketing Consultant |
| DeLucca Fence Company, Inc. | Methuen, MA | (978) 688-2877 | Highway Guardrails & Fencing |
| Dunlap/HRH of Northern New England | Manchester, NH | (603) 627-9583 | Insurance/Bonding |
| Earthwork Estimates E-Mail | N. Sutton, NH | (603) 927-4884 | Consultant |
| East Coast Utilities Corp. | Pembroke, NH | (603) 424-0777 | Road, Site & Utility Contractor |
| ECS Marin (Environmental Compliance) | Bow, NH | (603) 224-8871 | Environmental Consulting & Engineering |
| Everett J. Prescott, Inc. | Concord, NH | (603) 224-9545 | Utility & Pipe Supplies Distribution |
| F.W. Dodge | Manchester, NH | (603) 645-6562 | Reporting Service |
| Gemini Electric, Inc. | Auburn, NH | (603) 644-7170 | Electrical Contractor |
| Geotechnical Services, Inc. | Goffstown, NH | (603) 624-2722 | Geotechnical & Environmental Engineering, Materials Testing, Construction Monitoring |
| GMI Asphalt Corporation | Gilford, NH | (603) 524-0200 | Asphalt/Tar/Emulsions |
| Gordon Construction Corp. | Pittsfield, ME/Candia, NH | (207) 487-5366 (603) 483-5722 | Erosion Control Specialists |
| Gove Environmental Services, Inc. E-Mail | Stratham, NH | (603) 778-0644 | Wetland Consulting & Soil Mapping |
| GZA Geoenvironmental, Inc. | Manchester, NH | (603) 623-3600 | Geotechnical/Environmental Consultants |
| H.L. Turner Group | Concord, NH | (603) 228-1122 | Consulting Architects & Engineers |
| Hansen-Fox Company Inc. | Concord, NH | (603) 224-9951 | Mechanical Contractor |
| Harleysville Insurance Companies | Keene, NH | (603) 357-1998 | Insurance & Boding |
| Infantine Insurance, Inc. | Manchester, NH | (603) 669-0704 | Insurance/Bonding |
| Jaworski Geotech, Inc. | Manchester, NH | (603) 647-9700 | Geotechnical & Environmental Engineering |
| L&D Safety Marking Corp. E-Mail | Barre, VT | (802) 223-6154 | Pavement Markings |
| Liberty Mutual Insurance Company | Bedford, NH | (800) 562-3936 | Insurance/Bonding |
| Maine Drilling & Blasting, Inc. | Gardiner, ME | (603) 647-0299 | Drilling/Blasting/Explosives |
| Manchester Mack Sales, Inc. | Manchester, NH | (603) 668-1700 | Equipment/Machinery Dealer |
| Manchester Redimix Concrete, Inc. | Manchester, NH | (603) 623-4373 | Concrete, Sand & Gravel Supplier |
| Manchester Sand Gravel & Cement | Hooksett, NH | (603) 668-4000 | Concrete, Sand & Gravel Supplier |
| Merrimack Sheet Metal, Inc. | Concord, NH | (603) 224-7766 | Mechanical Contractor |
| Michie Corporation | Henniker, NH | (603) 428-3218 | Concrete, Sand & Gravel Supplier |
| Milton-CAT, Inc. | Concord, NH | (603) 746-4611 | Equipment/Machinery Dealer |
| Moulton Construction, Inc. E-mail | West Lebanon, NH | (603) 298-5761 | Sitework Construction |

| | | | |
|---|---|---|---|
| **Munsey & Brazil, Inc.** | Laconia, NH | (603) 524-2425 | Insurance/Bonding |
| **Nathan Wechsler & Company, P.A.** | Concord, NH | (603) 224-5357 | Accounting/Financial Services |
| **National Business Furniture** | Dracut, MA | (978) 970-2022 | Furniture Sales for Offices, Schools, etc. |
| **NationsRent** | Candia, NH | (603) 430-9090 | Equipment/Machinery Dealer |
| **NAS Surety Group** | Manchester, NH | (603) 644-6690 | Insurance & Bonding |
| **Nelson, Kinder, Mosseau, & Saturley, PC** | Manchester, NH | (603) 647-1800 | Legal Services |
| **North American Reserve** E-Mail | Laconia, NH | (603) 527-0006 | Engineering/Environmental Consultant |
| **Nortrax Equipment** *(Formerly Grappone Industrial)* | Concord, NH | (603) 225-2769 | Equipment/Machinery Dealer |
| **Plourde Sand & Gravel Co., Inc.** | Suncook, NH | (603) 485-3061 | Sand & Gravel Supplier |
| **Pro-Site Construction, Inc.** | Salem, NH | (603) 893-3250 | Masonry Contractor |
| **Quinn Brothers Corp.** | Amherst, NH | (603) 881-3100 | Concrete Supplier |
| **R.C. Hazelton Company, Inc.** | Manchester, NH | (603) 627-7696 | Komatsu, Dressta, Dynapac, & Cubcablet dealer |
| **Rinker-Hydro Conduit** | Hampstead, NH | (603) 234-8766 | Concrete pipe, box culverts, stormceptor, manholes & inlets, joints & gaskets |
| **The Rowley Agency, Inc.** | Concord, NH | (603) 224-2562 | Insurance/Bonding |
| **Signature Press & Blueprinting** | Hooksett, NH | (603) 624-4025 | Construction Document Management & Reprographics |
| **Swenson Granite Company** | Concord, NH | (603) 225-2783 | Granite Curbing |
| **St. Paul - Travelers Bond** | Westbrook, ME & Quincy, MA | (207) 857-2031 (617) 984-1211 | Insurance/Bonding |
| **Wakefield Materials Corp.** | Raymond, NH | (603) 895-4886 | Concrete, Sand & Gravel Supplier |
| **Waste, Inc.** | Concord, NH | (603) 224-6596 | Safety Supplies |
| **Weston Solutions** | Manchester, NH | (603) 656-5400 | Engineering/Environmental Consultant |
| **Wiggin & Nourie, PA** | Manchester, NH | (603) 669-2211 | Law Firm |
| **Williams Scotsman, Inc.** | Pelham, NH | (800) 782-1500 | Mobile Offices, Modular Space, Turn Key Services |
| **Worksafe Traffic Control Industries** | Barre, VT | (802) 223-8948 | Sign Manufacturing, resale of traffic control devices, equipment rental |

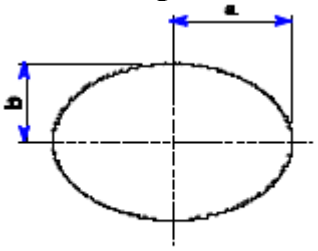
# FORMULARS & CONVERSIONS

## A. FORMULAS – AREAS & VOLUMES:

### AREAS AND VOLUMES

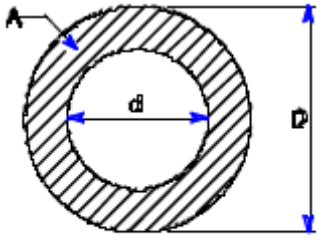
| | | | |
|---|---|---|---|
| ○ | **Circle** circumference | = ∏ d = 2 ∏ r | (∏= pi = 3.14159, d= diameter, r = radius) |
| ● | Area of a **Circle** | = ∏ $d^2$ / 4 = ∏ $r^2$ | (∏= pi = 3.14159, d= diameter, r = radius) |
| ● | Volume of a **Sphere** | = ∏ $d^3$ / 6 = 4/3 ∏ $r^3$ | (∏= pi = 3.14159, d= diameter, r = radius) |
| ■ | Area of a **Square** | = $s^2$ | (s = length of each side) |
| ▮ | Area of a **Rectangle** | = Base x height = b x h | |
| ▲ | Area of a **Triangle** | = ½ base x perpendicular height = ½ b x h | |
| ▲ | Volume of a **Cone** | = 1/3 base area x perpendicular height = 1/3 $b_A$ x h | |

### Ellipse:



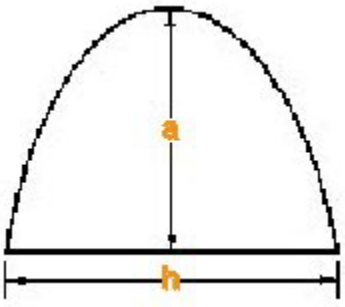

$A = \pi ab$

### Annulus (Circular Ring):




$$A = \frac{\pi}{4}\left(D^2 - d^2\right)$$

### Parabola:

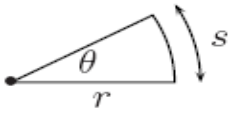



**Area** = 2/3 ah

## A. FORMULAS – AREAS & VOLUMES (Continued):

**AREAS AND VOLUMES**

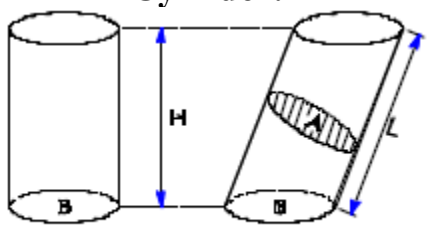
### Sector of a Circle:




$$s = r\theta$$

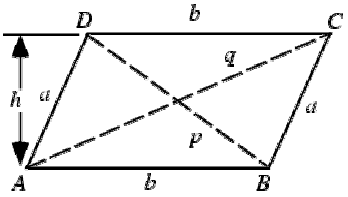
**Area** = ½ r s

### Cylinder:



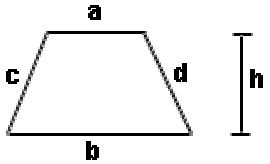

$S = PH = P_A L$ $\qquad$ $V = BH = AL$

**Parallelogram:** A quadrilateral with opposite sides parallel (and therefore opposite angles equal). A quadrilateral with equal sides is called a rhombus, and a parallelogram whose angles are all right angles is called a rectangle. The polygon diagonals of a parallelogram bisect each other.



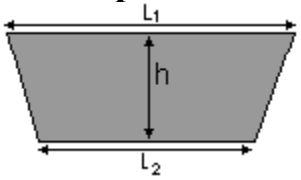

$$A = bh = ab\sin A = ab\sin B.$$

### Trapezoid:




**Area** = 1/2 h(a + b)

### Trapezium:

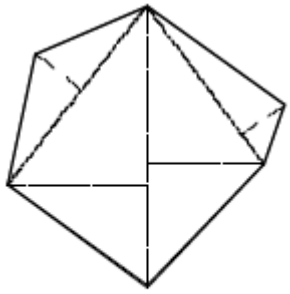



**Area** = 1/2 height x sum of parallel sides = 1/2 x h x (L1 + L2)

## A. FORMULAS – AREAS & VOLUMES (Continued):

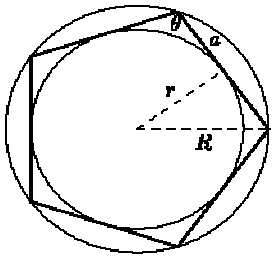
**AREAS AND VOLUMES**

**Polygon:**



Divide into triangles
A = Sum of all triangles

**Regular Polygon:** A polygon whose sides are all the same length, and whose angles are all the same. The sum of the angles of a polygon with $k$ sides, where $k$ is 3 or more, is $180° \times (k - 2)$ degrees. For a $k$-sided regular polygon of side $a$, let $\theta$ be the angle at any vertex, $r$ and $R$ the radii of the inscribed and circumscribed circles ($r$ is called the apothem). As usual, let $s = \frac{1}{2}ka$ be the half-perimeter. Then:

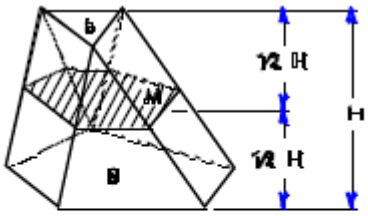



| REGULAR POLYGON FORMULAS | | | | |
|---|---|---|---|---|
| Name | K | **Area** | r | R |
| equilateral triangle | 3 | 0.43301 $a^2$ | 0.28868 a | 0.57735 a |
| Square | 4 | $a^2$ | 0.5 a | 0.70711 a |
| regular pentagon | 5 | 1.72048 $a^2$ | 0.68819 a | 0.85065 a |
| regular hexagon | 6 | 2.59808 $a^2$ | 0.86603 a | a |
| regular heptagon | 7 | 3.63391 $a^2$ | 1.03826 a | 1.15238 a |
| regular octagon | 8 | 4.82843 $a^2$ | 1.20711 a | 1.30656 a |
| regular nonagon | 9 | 6.18182 $a^2$ | 1.37374 a | 1.46190 a |
| regular decagon | 10 | 7.69421 $a^2$ | 1.53884 a | 1.61803 a |
| regular undecagon | 11 | 9.36564 $a^2$ | 1.70284 a | 1.77473 a |
| regular dodecagon | 12 | 11.19625 $a^2$ | 1.86603 a | 1.93185 a |

## A. FORMULAS – AREAS & VOLUMES (Continued):

**AREAS AND VOLUMES**

### Prismoidal Formula:

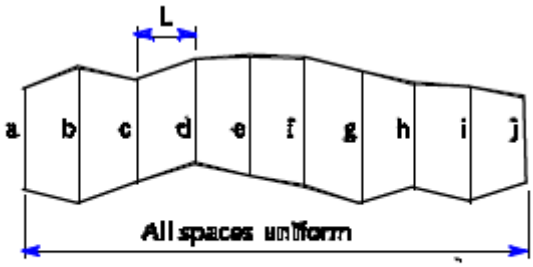



$$V = \frac{H}{6}(B + b + 4M)$$

**M** = Area of section parallel to bases, Midway between them

**b** = area of top

### Irregular Figure:

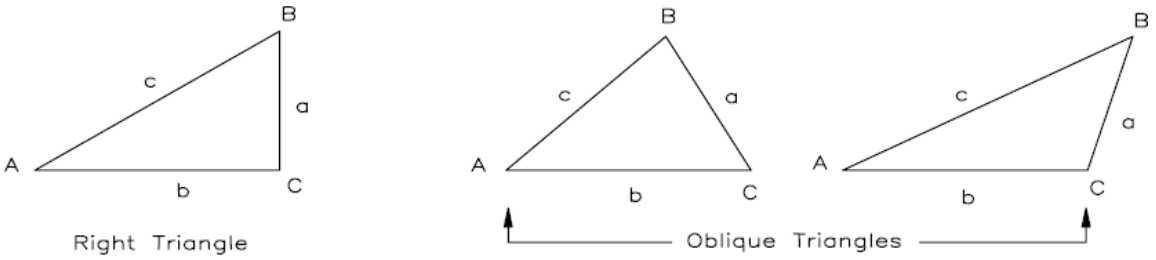



$$A = L\left(\frac{a+j}{2} + b + c + d + e + f + g + h + i\right)$$

## B. FORMULAS – TRIANGLES:

(SOURCE: http://www.ncees.org/exams/study_materials/land_surveying_equations.pdf )

### TRIGONOMETRIC FORMULAS




### SOLUTION OF RIGHT TRIANGLES

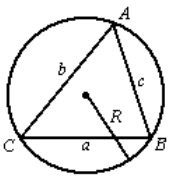
For angle A: $\sin A = a/c$; $\cos A = b/c$; $\tan A = a/b$; $\cot A = b/a$; $\sec A = c/b$; $\operatorname{cosec} A = c/a$

| Given | Required | | |
|---|---|---|---|
| a, b | A, B, c | $\tan A = a/b = \cot B$; | $c = \sqrt{a^2+b^2} = a\sqrt{1+b^2/a^2}$ |
| a, c | A, B, b | $\sin A = a/c = \cos B$; | $b = \sqrt{(c+a)(c-a)} = c\sqrt{1-a^2/c^2}$ |
| A, a | B, b, c | $B = 90° - A$; $b = a \cot A$; | $c = a/\sin A$ |
| A, b | B, a, c | $B = 90° - A$; $a = b \tan A$; | $c = b/\cos A$ |
| A, c | B, a, b | $B = 90° - A$; $a = c \sin A$; | $b = c \cos A$ |

### SOLUTION OF OBLIQUE TRIANGLES

| Given | Required | | | |
|---|---|---|---|---|
| A, B, a | b, c, C | $b = (a \sin B)/\sin A$; | $C = 180° - (A + B)$; | $c = (a \sin C)/\sin A$ |
| A, a, b | B, c, C | $\sin B = (b \sin A)/a$; | $C = 180° - (A + B)$; | $c = (a \sin C)/\sin A$ |
| a, b, C | A, B, c | $A + B = 180° - C$; | $\tan (A - B)/2 = [(a - b)/(a + b)][\tan (A + B)/2]$ | |
| | | | $c = (a \sin C)/\sin A$ | |
| a, b, c | A, B, C | $s = (a + b + c)/2$; | $\sin (A/2) = \sqrt{[(s-b)(s-c)]/bc}$ ; | |
| | | $\sin (B/2) = \sqrt{[(s-a)(s-c)]ac}$ ; | $C = 180° - (A + B)$ | |
| a, b, c | Area | $s = (a + b + c)/2$; | $\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$ | |
| A, b, c | Area | $\text{Area} = (bc \sin A)/2$ | | |
| A, B, C, a | Area | $\text{Area} = (a^2 \sin B \sin C)/(2 \sin A)$ | | |

### LAW OF SINES

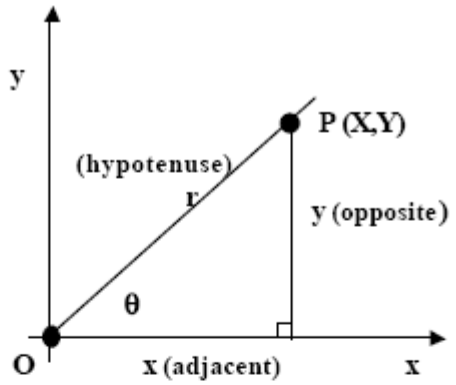



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = 2R$$

## B. FORMULAS – TRIANGLES (Continued):

(SOURCE: W.S.D.O.T. Highway Engineering Field Formulas, 1998, Engineering Publications, WA)

### TRIGONOMETRIC FUNCTIONS




| | |
|---|---|
| Sine | $\text{Sin}\theta = \frac{y}{r} = \frac{\text{opposite}}{\text{hypotenuse}}$ |
| Cosine | $\cos\theta = \frac{x}{r} = \frac{\text{adjacent}}{\text{hypotenuse}}$ |
| Tangent | $\tan\theta = \frac{y}{x} = \frac{\text{opposite}}{\text{adjacent}}$ |
| Cotangent | $\cot\theta = \frac{x}{y} = \frac{\text{adjacent}}{\text{opposite}}$ |
| Secant | $\sec\theta = \frac{r}{x} = \frac{\text{hypotenuse}}{\text{adjacent}}$ |
| Cosecant | $\csc\theta = \frac{r}{y} = \frac{\text{hypotenuse}}{\text{opposite}}$ |
| Reciprocal Relations | $\sin\theta = \frac{1}{\csc}$ $\tan\theta = \frac{1}{\cot\theta}$ $\cos\theta = \frac{1}{\sec}$ |
| Rectangular | $X = r \cdot \cos\theta$ $y = r \cdot \sin\theta$ |
| Polar | $r = \sqrt{(x^2 + y^2)}$ $\theta = \arctan\frac{y}{x}$ |

**C. CONVERSIONS - SLOPE:**

| SLOPE CONVERSION TABLE | | | | | |
|---|---|---|---|---|---|
| Percent Slope | Inches per foot | | Inches per 10' | Inches per 15' | Inches per 20' |
| | Actual decimal | Approx. fraction | | | |
| 0.10% | 0.012 | 1/64 | 1/8 | 3/16 | 1/4 |
| 0.13% | 0.015 | 1/64 | 5/32 | 7/32 | 5/16 |
| 0.20% | 0.024 | 1/32 | 1/4 | 3/8 | 15/32 |
| 0.26% | 0.031 | 1/32 | 5/16 | 15/32 | 5/8 |
| 0.30% | 0.036 | 3/64 | 3/8 | 17/32 | 23/32 |
| 0.40% | 0.048 | 3/64 | 1/2 | 23/32 | 31/32 |
| 0.50% | 0.060 | 1/16 | 19/32 | 29/32 | 1 3/16 |
| 0.52% | 0.062 | 1/16 | 5/8 | 15/16 | 1 1/4 |
| 0.60% | 0.072 | 5/64 | 23/32 | 1 3/32 | 1 7/16 |
| 0.78% | 0.093 | 3/32 | 15/16 | 1 13/32 | 1 7/8 |
| 0.80% | 0.096 | 3/32 | 31/32 | 1 7/16 | 1 29/32 |
| 1% | 0.120 | 1/8 | 1 3/16 | 1 13/16 | 2 13/32 |
| 2% | 0.180 | 3/16 | 1 13/16 | 2 11/16 | 3 19/32 |
| 2% | 0.240 | 1/4 | 2 7/16 | 3 5/8 | 4 13/16 |
| 3% | 0.360 | 3/8 | 3 5/8 | 5 7/16 | 7 3/16 |
| 4% | 0.480 | 1/2 | 4 13/16 | 7 1/4 | 9 19/32 |

(SOURCE: NHDOT Construction Manual, 1983 insert)

| Shoulder Slope | Equivalent Rate of Grade | Equivalent Vertical Angle |
|---|---|---|
| 1:1.5 | 66.67% | 33°41'24" |
| 1:1.75 | 57.14% | 29°44'42" |
| 1:2 | 50.00% | 26°33'54" |
| 1:2.5 | 40.00% | 21°48'05" |
| 1:3 | 33.33% | 18°26'06" |
| 1:4 | 25.00% | 14°02'10" |
| 1:5 | 20.00% | 11°18'36" |
| 1:6 | 16.67% | 9°27'44" |
| 1:8 | 12.50% | 7°07'30" |
| 1:10 | 10.00% | 5°42'38" |

| Subgrade Slope | Equivalent Rate of Grade | Equivalent Vertical Angle |
|---|---|---|
| .020 / 1 | 2.00% | 1°08'45" |
| .025 / 1 | 2.50% | 1°25'56" |
| .030 / 1 | 3.00% | 1°43'06" |
| .035 / 1 | 3.50% | 2°00'16" |
| .040 / 1 | 4.00% | 2°17'26" |
| .050 / 1 | 5.00% | 2°51'45" |

**(SOURCE: W.S.D.O.T. Highway Engineering Field Formulas, 1998, Engineering Publications, WA)**

## D. CONVERSIONS – GENERAL:

| MULTIPLY | BY | TO OBTAIN |
|---|---|---|
| Acres | 43,560 | Square feet |
| Acres | 0.001562 | Square miles |
| Barrels of Cement | 376 | Pounds of cement |
| Bags of Cement (1 cf) | 94 | Pounds of cement |
| B.T.U. | 778.26 | ft-lbs |
| Cubic feet | 7.48052 | U.S. Gallons |
| Cubic feet | 1,728 | Cubic inches |
| Cubic feet of water | 62.37 | Pounds of water |
| Cubic feet of water | 28.29 | Kilograms of water |
| Cubic inches | 0.004329 | U.S. gallons |
| Cubic yards | 27 | Cubic feet |
| Cubic yards | 46.656 | Cubic inches |
| Cubic yards | 202 | U.S. gallons |
| *° Celsius = 5/9 (° F – 32)* | | |
| *° Fahrenheit = 9/5 ° C + 32* | | |
| Fathoms | 6 | Feet |
| U.S. gallons | 231 | Cubic inches |
| U.S. gallons | 3.785 | Liters |
| Gallons of water | 8.34 | Pounds of water |
| Gallons of water | 3.785 | Kilograms of water |
| Hectare | 10,000 | Square meters |
| Horsepower | 550 | ft-lbs / sec. |
| Horsepower | 33000 | ft-lbs / min. |
| Horsepower | 2544 | B.T.U.'s / hr |
| Horsepower | 745.5 | Watts |
| Miles | 5,280 | Feet |
| Pounds | 16 | Ounces |
| Pounds of Water | 0.01602 | Cubic feet |
| Pounds of Water | 27.68 | Cubic inches |
| Pounds of Water | 0.1198 | U.S. Gallons |
| Rod | 16.5 | Feet |
| Speed of Light | 186,000 | Miles/second |
| Speed of light | 300,000 | Km/s |
| Square feet | 144 | Square inches |
| Square miles | 640 | Acres |
| Square yards | 9 | Square feet |
| Square yards | 0.0002066 | Acres |
| Tons (short) | 2,000 | Pounds |
| Tons (long | 2,240 | Pounds |

**E. CONVERSIONS - METRIC:**

(SOURCE: NHDOT Metric Conversion Guide – May 1998)

# NHDOT METRIC CONVERSION TABLE

| *STANDARD CONVERSION TABLE - ENGLISH TO METRIC* | | | | |
|---|---|---|---|---|
| Symbol | To convert from | Multiply by | To determine | Symbol |
| | | **LENGTH** | | |
| IN | inch | 25.4 | Millimeters | mm |
| FT | feet | 0.3048 | Meters | m |
| YD | yards | 0.9144 | Meters | m |
| MI | miles | 1.609344 | Kilometers | km |
| | | **AREA** | | |
| SI | square inches | 645.16 | square millimeters | $mm^2$ |
| SF | square feet | 0.09290304 | square meters | $m^2$ |
| SY | square yards | 0.83612736 | square meters | $m^2$ |
| A | acres | 0.4046873* | hectares (= 10 000 $m^2$) | ha |
| $MI^2$ | square miles | 2.59 | square kilometers | $km^2$ |
| | | **VOLUME** | | |
| CI | cubic inches | 16.387064 | cubic centimeters | $cm^3$ |
| CF | cubic feet | 0.0283168 | cubic meters | $m^3$ |
| CY | cubic yards | 0.764555 | cubic meters | $m^3$ |
| GAL | gallons | 3.78541 | Liters | L |
| OZ | fluid ounces | 0.0295735 | Liters | L |
| MBM | thousand board feet | 2.35974 | cubic meters | $m^3$ |
| | | **MASS** | | |
| LB | pounds | 0.4535924 | Kilograms | kg |
| TON | Short tons (2000 lbs) | 0.9071848 | metric tons (= 1000 kg) | t |
| | | **PRESSURE AND STRESS** | | |
| TSF | Tons per square foot | 95.7606 | Kilopascals | kPa |
| PSF | pounds per square foot | 47.8803 | Pascals | Pa |
| PSI | pounds per square inch | 6.89476 | Kilopascals | kPa |
| PSI | pounds per square inch | 0.00689476 | Megapascals | MPa |
| | | **DISCHARGE** | | |
| CFS | Cubic feet per second | 0.02831 | cubic meters per second | $m^3/s$ |
| | | **VELOCITY** | | |
| FT/SEC | feet per second | 0.3048 | meters per second | m/s |
| | | **INTENSITY** | | |
| IN/HR | Inch per hour | 25.4 | millimeters per hour | mm/hr |
| | | **FORCE** | | |
| LB | pound (force) | 4.448222 | Newtons | N |

| | | | | |
|---|---|---|---|---|
| | | **POWER** | | |
| HP | horsepower | 746.0 | Watts | W |
| | | **TEMPERATURE** | | |
| °F | degrees Fahrenheit | 5 X (°F - 32)/9 | degrees Celsius | °C |
| | | **DENSITY** | | |
| $lb/ft^3$ | pounds per cubic foot | 16.01846 | kilograms per cubic meter | $kg/m^3$ |
| | | **ACCELERATION** | | |
| G | freefall,standard | 9.807 | meters per second squared | $m/s^2$ |

*BASED ON U.S. SURVEY FOOT. SEE PAGE 3.

TO CONVERT FROM METRIC TO ENGLISH, DIVIDE BY THE ABOVE CONVERSION FACTORS

# GENERAL RULES

## 1. Rules for Writing Metric Symbols and Names

- Print unit symbols in lower case except for liter (L), or unless the unit name is derived from a proper name. Print unit names in lower case, even those derived from a proper name [e.g., newton (N), pascal(Pa)].
- Print decimal prefixes in lower case for magnitudes $10^3$ and lower [that is, k ($10^3$), m ($10^{-3}$), μ ($10^{-6}$), and n ($10^{-9}$)] and print the prefixes in upper case for magnitudes $10^6$ and higher [that is, M ($10^6$) and G ($10^9$)].
- Leave a space between a numeral and a symbol (write 45 kg or 37 °C, not 45kg or 37°C or 37° C).
- Do not leave a space between a unit symbol and its decimal prefix (write kg, not k g).
- Do not use the plural of unit symbols (write 45 kg, not 45 kgs), but do use the plural of written names (several kilograms).
- For technical writing, use symbols in conjunction with numerals (the area is 10 $m^2$); write out unit names if numerals are not used (sidewalk is measured in square meters). Numerals may be combined with written unit names in non-technical writing (10 meters).
- Indicate the product of two or more units in symbolic form by using a dot positioned above the line ($kg \cdot m \cdot s^{-2}$).
- Do not mix names and symbols (write N·m or newton meter, not N·meter or newton·m).
- Do not use a period after a symbol (write "12 g" not "12 g.") except when it occurs at the end of a sentence.

## 2. Rules for Writing Numbers

- Always use decimals, not fractions (write 0.75 g, not 3/4 g).
- Use a zero before the decimal marker for values less than one (write 0.45 g, not .45 g).
- Use spaces instead of commas to separate blocks of three digits for any numbers over four digits (write 45 138 kg or 4371 kg). Note that this does not apply to coordinates or the expression of amounts of money.
- In the United States, the decimal marker is a period; in other countries a comma is used.

### 3. Soft vs. Hard Conversions

- In a "soft" conversion, a measurement in English units is mathematically converted to its exact (or nearly exact) metric equivalent. With "hard" conversion, a new , rounded, rationalized metric number is created that is convenient to work with and easy to remember.

  Examples:

  a. Consider a 12-foot travel lane

  - Soft conversion (exact equivalent)

| English unit | | Conversion Factor | | Metric Unit |
|---|---|---|---|---|
| 12 ft | x | 0.3048 m/ft | = | 3.658 m |

  - Hard conversion = 3.6 m which is established by AASHTO and is about

  1.58% less than 12' lane.

b. 3' -0" thick footing

  - Soft conversion (exact equivalent) 3' -0" x 304.8 mm/ft = 914.4 mm
  - Hard conversion = 900 mm

- In general, simple mathematical dimensional conversion should be avoided where possible. 12" = 304.8 mm is not a clear rational number. It should be rounded to 300 mm.
- Whenever possible, convert measurements to rounded, rationalized "hard" metric numbers. For instance, if anchor bolts are to be imbedded to a depth of 10 inches, the exact converted length of 254 mm might be rounded to either 250 mm (9.84 inches) or 260 mm (10.24 inches). The less critical the number, the "rounder" it can be, but ensure that allowable tolerances or safety factors are not exceeded. When in doubt, stick with the exact "soft" conversion.
- Round to "preferred" metric numbers. While the preferred numbers for the "1 foot = 12 inches" system are, in order of preference, those divisible by 12, 6, 4, 3, 2 and 1, preferred metric numbers are, in order of preference, those divisible by 10, 5, 2 and 1 or decimal multiples thereof.

Rational Equivalents for conversion:

1" = 25 mm

4" = 100 mm

6" = 150 mm

12" = 300 mm

16" = 400 mm

24" = 600 mm

- Ensure that rounding does not exceed the allowable tolerances for fabrication or stresses.

a. Soft (exact) conversions shall be used on all proprietary items such as expansion joints, etc. In general, use soft (exact) conversion when no physical change to the item is desired.

b. Concrete items which are currently produced by using fixed forms shall be soft converted. An exception to this rule are concrete pipes, which use nominal dimensions and are hard converted.

c. Hard conversions shall be used for most concrete dimensions of formed members, beam spacing, pile spacing, reinforcement spacing. In general, use hard conversion when physical change to the item is permissible.

d. Whole millimeters should be used for measurements, unless extreme precision is required.

**4. Basis of Conversion**

- NHDOT has chosen ASTM E 380-93 "Standard Practice For Use of The International System of Units" as the reference document for conversion and rounding.

- The basis for metric conversion in New Hampshire by State Law is 39.37 inches = 1 meter , which is known as the U.S. Survey Foot. The New Hampshire State Plane Coordinate System of 1983 is based on the U.S. Survey Foot. The more common conversion factor is 1 inch = 25.4 millimeters which is known as the International Foot.

U.S. Survey Foot: 1 m = 39.37 / 12 = 3.280833333 ft

International Foot: 1 m = 3.280839895... ft

- The difference between the U.S. Survey Foot and the International Foot is approximately 2 parts per million and for distances less than 1500 ft the difference between the two methods is less than 0.01 ft. Most calculators and computer programs use the International Foot conversion. Most total station survey equipment uses the U.S. Survey Foot conversion. Care should be taken when converting survey data ( i.e., coordinates, stationing ) from English to metric.

NOTE: COORDINATES ARE GREATLY AFFECTED BY THE DIFFERENCE BETWEEN THE U.S. SURVEY FOOT AND THE INTERNATIONAL SURVEY FOOT. BE VERY CAREFUL.

- The meter is the basic unit for linear measurement, the millimeter is a sub-unit. The centimeter is not used on highway or bridge plans. The kilometer may be used in applications where miles were formerly used.

- Square meters shall be used for area, except hectares shall be used for areas of land and water greater than 50 $m^2$.

- Liters shall be used for volume and fluid capacity, but liters should not be used as a unit for a pay item.
- Rule of thumb for conversion:

| ENGLISH | METRIC |
|---|---|
| Even feet (no inches) > 1 m | Nearest m or m to nearest 0.1 m |
| Feet and inches > 1 m | m to nearest 0.1 m or 0.01 m |
| Inches and fractions of an inch | mm |
| Even feet (no inches) < 1 m | Nearest 0.1 m or mm |
| Feet and inches < 1 m | Nearest 0.1 m, 0.01 m, 0.001m or mm |
| Feet, inches and fractions of an inch > 1 m | m to nearest 0.01 m or 0.001 m |
| Feet, inches and fractions of an inch < 1 m | m to nearest 0.001 m or mm |

Notwithstanding the above rule, units used on individual details should be consistent (i.e., all meters or all millimeters) unless mixed units are needed for accuracy or clarification, or convention (e.g., typical cross-sections use meters horizontally and millimeters vertically). Dimensions generally should not be given in millimeters that are in magnitudes greater than $10^4$ (i.e., 9980 mm, 10.025 m).

Accuracy of English number should be known prior to conversion, e.g., a length of 125 ft. converts exactly to 38.1 m. If, however, the 125 ft length had been obtained by rounding to the nearest 5 ft, the conversion should be given as 38 m and if it had been obtained by rounding to the nearest 25 ft, the conversion should be given as 40 m.

## MISCELLANEOUS CONVERSIONS:

### 1. Conversions for Digitizing Plans and Cross Sections:

N $in^2$ x C $ft^2/in^2$ ($m^2/in^2$) = A $ft^2$ ($m^2$)
N = number of $in^2$ digitized; C = conversion factor; A = area $ft^2$ ($m^2$)
For example:

Digitized 6.32 inches of common excavation on a 20 scale x-section.
Area of excavation at that section:

N $in^2$ x C $ft^2/in^2$ = A $ft^2$
6.32 $in^2$ x 400 $ft^2/in2$ = 2528 $ft^2$

| English | Conversion Factor (C) |
|---|---|
| 1” = 10’ (10 scale) | 100 $ft^2$ / $in^2$ |
| 1” = 20’ (20 scale) | 400 $ft^2$ / $in^2$ |
| 1” = 50’ (50 scale) | 2500 $ft^2$ / $in^2$ |

| Metric | Conversion Factor (C) |
|---|---|
| 1:50 | 1.61 $m^2$ / $in^2$ |
| 1:100 | 6.45 $m^2$ / $in^2$ |

| | |
|---|---|
| 1:250 | 40.32 $m^2$ / $in^2$ |
| 1:500 | 161.29 $m^2$ / $in^2$ |

(SOURCE: Metric Conversion Guide - May 1998)

**2. Pavement Unit Weights:**

| | | |
|---|---|---|
| Wearing/Leveling Courses | 0.057 T/SY/1" | (0.058 $t/m^2$/25 mm) |
| Binder Courses | 0.057 T/SY/1" | (0.059 $t/m^2$/25 mm) |
| Base Courses | 0.057 T/SY/1" | (0.060 $t/m^2$/25 mm) |

(SOURCE: Metric Conversion Guide - May 1998)

**3. Application Rate for Emulsified Asphalt for Tack Coat:**

| | |
|---|---|
| 0.025 GAL/SY | (0.116 $kg/m^2$) |

(SOURCE: Metric Conversion Guide - May 1998)

**4. Guardrail Warrants Based on Slope and Height of Embankment Only:**

| | |
|---|---|
| 4:1 slope | Barrier not needed for embankment. |
| 3:1 slope, H < 15 ft (4.5 m) | Barrier not needed for embankment. |
| 3:1 slope, H ≥ 15 ft (4.5 m) | Barrier warranted. |
| Steeper than 3:1 slope | Barrier warranted. |

(SOURCE: AASHTO Roadside Design Guide, 2002)

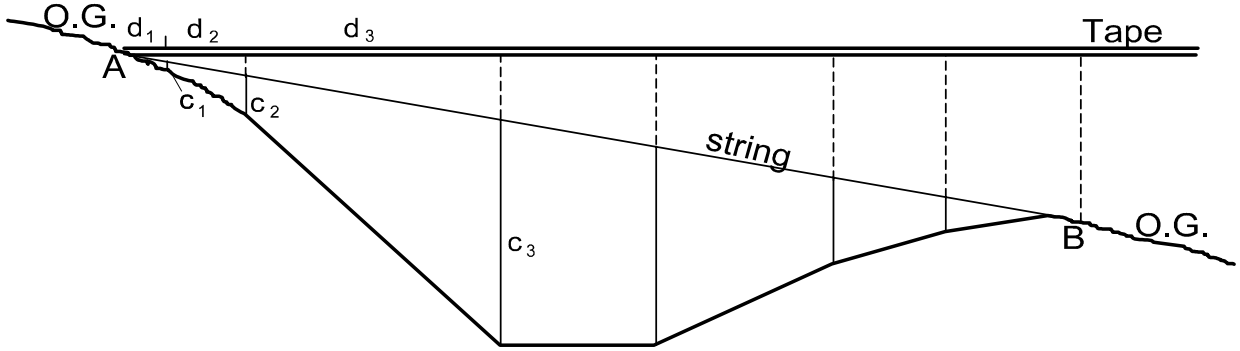
**5. Significant Temperatures:**

Freezing point of water = 32° F (0° C)
Boiling point of water at atmospheric pressure = 212° F (100° C)
Atmospheric pressure = 14.7 psi.
Absolute zero = -459.7° F (-273.2° C)

# FIELD LAYOUT & MEASUREMENT:

## 1. One Person Method of Measuring Drives, Approaches, and Ditches:

**"One Person" Method of Measuring Drives, Approaches, and Ditches**




Stretch string from O.G. at A to O.G. at B.

Fasten the zero mark on the tape at point A.

Measure horizontal distance from A to break in slope ($d_1$ on the tape).

Measure vertical distance from string to break in slope ($c_1$) using a rule.

Measure $c_2$ at $d_2$, $c_3$ at $d_3$, and so forth.

Compute area as follows:

$$\left(\frac{0+c_1}{2}\right)\times(d_1) + \left(\frac{c_1+c_2}{2}\right)\times(d_2) + \left(\frac{c_2+c_3}{2}\right)\times(d_3) + \ldots$$

## 2. Steel Tape Temperature Corrections:

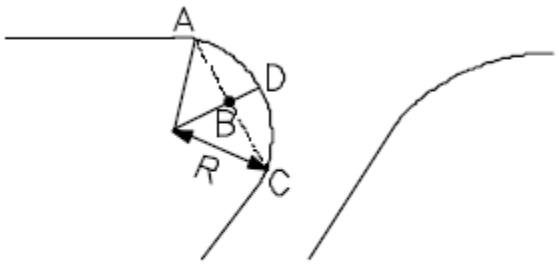
$C = 6.45 \cdot 10^{-6}(T_F - 68)\, L_f$

or

$C = 11.66 \cdot 10^{-6}(T_C - 20)\, L_m$

C = Correction
$T_F$ = Temperature in degrees Fahrenheit
$L_f$ = Length in feet
$T_c$ = Temperature in degrees Celsius
$L_M$ = Length in meters

### 3. Determining Radii of Sharp Curves by Field Measurements




$$R = \frac{BC^2}{2BD} + \frac{BD}{2}$$

$$BC = \frac{AC}{2}$$

Note: Points A and C may be any two points on the curve. Units may be metric or English.

Example:

1. Measure the chord length from A to C:
   AC = 18.4, then BC = 9.2
2. Measure the middle ordinate B to D:
   BD = 3.5
3. Compute the radius:
   $R = 9.2^2 / 7.0 + 3.5 / 2 = 13.8$

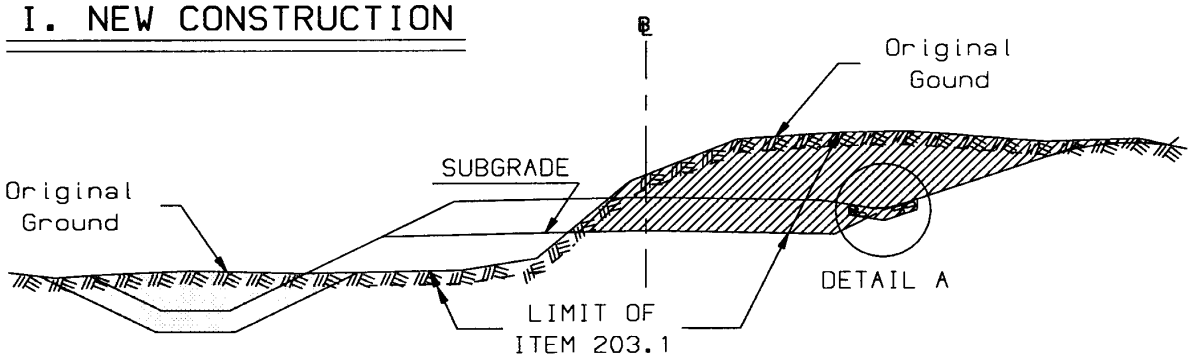
## 4. PAY LIMITS – COMMON EXCAVATION:

(SOURCE: Fig. 8-5 NHDOT Highway Design Manual - March 1999)

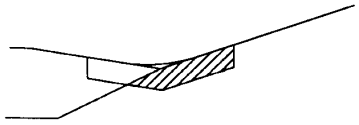
*ROADWAY AND DITCH EXCAVATION PAY LIMITS*

***FOR FURTHER INFORMATION, SEE STANDARDS SPECIFICATIONS SECTION 206. AND 203.5.1***

### I. NEW CONSTRUCTION



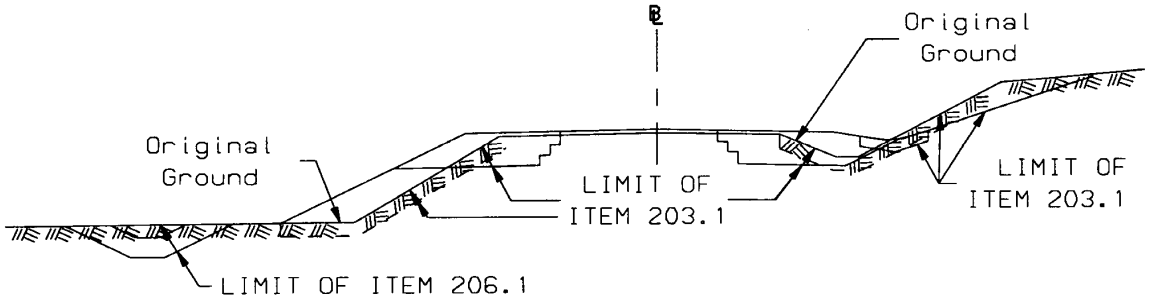

SHADED AREA WILL BE PAID AS ITEM 206.1 (THE DITCH IS NOT ADJACENT TO THE ROADWAY EXCAVATION; IT IS A SEPARATE EXCAVATION)



HATCHED AREA WILL BE PAID AS ITEM 203.1 (THE DITCH IS PART OF THE EXCAVATION FOR THE ROADWAY TYPICAL)

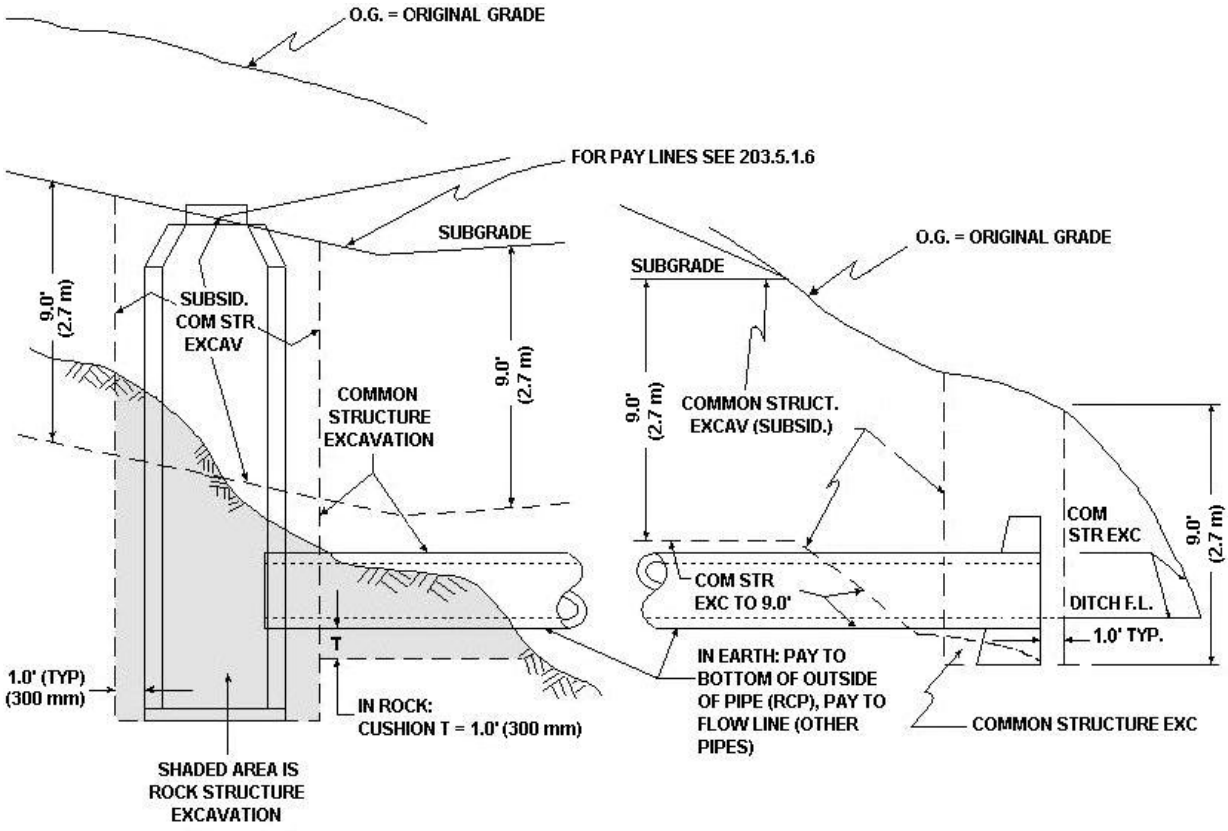
DETAIL A

### II. RECONSTRUCTION



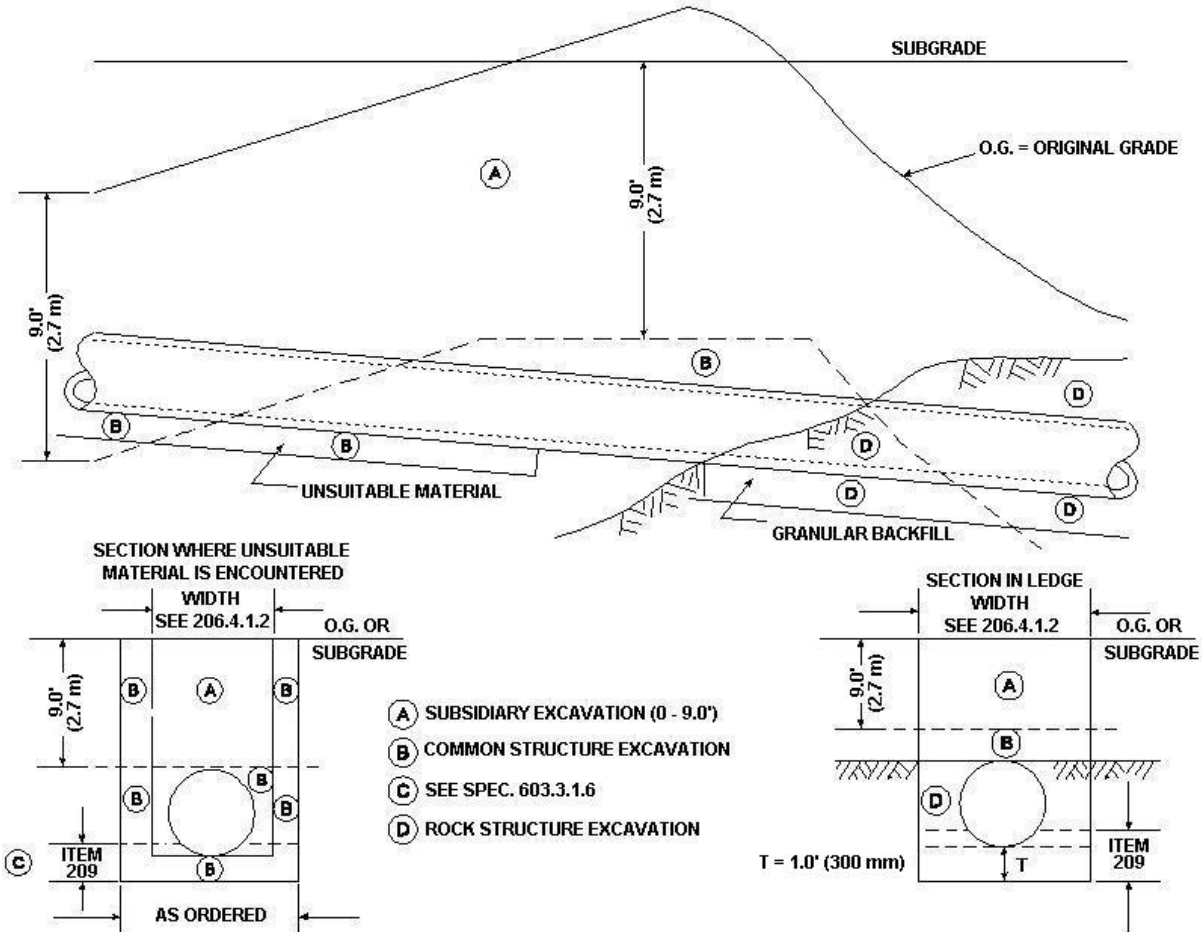
## 5. PAY LIMITS – STRUCTURE EXCAVATION:

(SOURCE: Appendix 8-2 NHDOT Highway Design Manual - March 1999)



## 5. PAY LIMITS – STRUCTURE EXCAVATION (Continued):

(SOURCE: Appendix 8-3 NHDOT Highway Design Manual - March 1999)



## 6. DRAINAGE:

(SOURCE: NHDOT Manual on Drainage Design for Highways)

1. Minimum pipe sizes for various storm water runoff conditions are:
   - Longitudinal pipes: 12" (300 mm)
   - Slope pipes: 12" (300 mm)
   - Drive pipes: 12" (300 mm)
   - Cross pipes: 15" (375 mm)

2. Minimum culvert sizes for the major functional classifications of highways are:
   - Interstate: 24" (600 mm)
   - Primary, Secondary: 18" (450 mm)
   - State-Aid: 15" (375 mm)
   - For expressway-type highways and highways designed for stage construction a minimum size of 24" (600 mm) should be used.

3. Minimum cover over pipes:
   - Under pavement: 4 feet (1.20.m)
   - Under drives: 1 foot (0.30 m)
   - Under non-paved areas: 2 feet (0.60 m).

4. The minimum pipe slope required to maintain a self-cleaning velocity is:
   - 0.4 % (0.004 feet per foot), or…
   - sufficient slope to maintain a velocity of 2 fps (0.61 m/s), flowing one-third full.

5. If the slope of the pipe > 20 percent, corrugated pipe with collars should be used.

6. The minimum gradient of an open water channel (w ≥10 ft (3 m)) or ditch (w < 10 ft (3 m)) is 0.25%.

7. At all catch basins or junction structures, a 0.25' (0.080 m) drop in flow line is desirable as a general rule. When excessive depths result from this rule, or the velocity exceeds 15fps (4.6 m/s), the Hydraulics Section should be consulted.

8. Spacing - Although the computed catch-basin spacing requirement may be of considerable distance, possibly 500 to 600 feet (150 m - 180 m), actual spacing should be held to a maximum of 400 feet (120 m), desirably 300 feet (90 meters). Basins may be less than 100 feet (30 m) apart, which is often the case at sags and at locations with considerable over-the-curb flow. Basins at sags may require supplemental basins placed at short distances on either side. Liberal openings should be provided.

## 6 DRAINAGE (Continued):

(SOURCE: NHDOT Manual on Drainage Design for Highways)

9. Underdrains of 6" (150 mm) diameter should be allowed to run no more than 600 feet (180 m). For distances over 600 feet (180 m), the minimum diameter may be increased to 12" (300 mm), or flushing basins should be provided.

10. The most common empirical equation used for pipe flowing full is:

**Manning's Equation:**

v = $(K/n) \times R^{2/3} \times S^{1/2}$ (English Units) [SI units]

**Q = vA = K/n x $AR^{2/3}$ x $S^{1/2}$**

S = $n^2Q^2/(K^2 \times A^2 \times R^{4/3})$

v = Fluid Velocity (ft/s) or [m/s]
Q = Flow-Discharge (cfs) or [m3/sec]
K = 1.486 (English); K = 1.00 [SI]
R = Hydraulic Radius (ft) or [m] = $A/P_w$
A = Cross-Sectional Area of Flow ($ft^2$) or [m2]
$P_w$ = Wetted Perimeter (ft) or [m]
S = Channel Slope
n = Manning's Roughness Coefficient
n = 0.010 (smooth plastic)
n = 0.012 (new rcp)
n = 0.015 (old rcp)
n = 0.024 (corrugated pipe – metal or plastic)

# GEOMETRICS

## A. GEOMETRICS - MISCELLANEOUS:

(SOURCE: NHDOT Metric Conversion Guide – May 1998)

### 1. Permanent Lane Drop Tapers:

| Design Speed | | Taper | |
|---|---|---|---|
| ENGLISH | METRIC | ENGLISH | METRIC |
| 30 mph | 50 km/h | 30:1 | 30:1 |
| 40 mph | 60 km/h | 40:1 | 40:1 |
| 45 mph | 70 km/h | 45:1 | 45:1 |
| 50 mph | 80 km/h | 50:1 | 50:1 |
| 55 mph | 90 km/h | 55:1 | 55:1 |
| 60 mph | 100 km/h | 60:1 | 60:1 |
| 70 mph | 110 km/h | 70:1 | 70:1 |

### 2. Vertical Clearances:

"Vertical clearance is measured from overhead structures to the finished roadway surface or highest rail of the railroad. The designated clearance must be provided over the entire useable roadway width including shoulders" (NHDOT Highway Design Manual, March 1999).

**MINIMUM VERTICAL CLEARANCES**

| | |
|---|---|
| Local road under Interstate with interchange | 16'-6" (5.1 m) |
| Local road under Interstate without interchange | 14'-6" (4.5 m) |
| Local road under all other roads | 14'-6" (4.5 m) |
| Local road under railroads | 14'-6" (4.5 m) |
| State Route under Interstate with interchange | 16'-6" (5.1 m) |
| State Route under Interstate without interchange | 14'-6" (4.5 m) |
| State Route under all other roads | 14'-6" (4.5 m) |
| State Route under railroads | 14'-6" (4.5 m) |
| Interstate Route under all roads | 16'-6" (5.1 m) |
| Interstate Route under railroads | 16'-6" (5.1 m) |
| Railroad under all roads | 22'-6" (6.9 m) |

### 3. Parking Spaces:

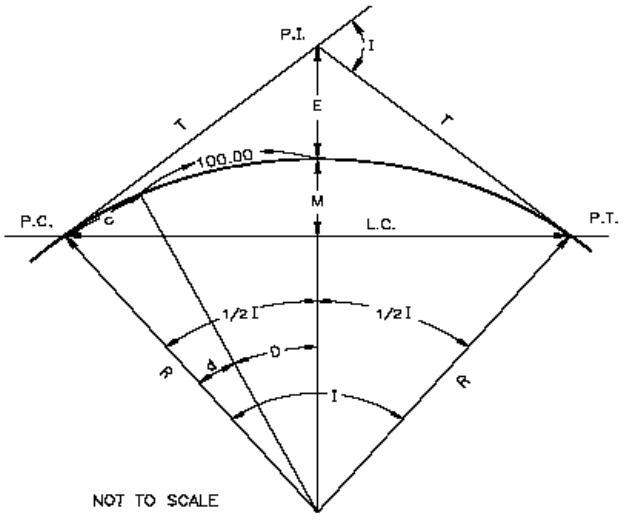
| | | | |
|---|---|---|---|
| Stall | 10' x 20' | (high turnover) | 3 x 6 m |
| | 9' x 18.5 | (low turnover) | 2.7 x 5.7 m |
| Parallel | 8' x 22' to 26' | | 2.4 x 6.6 to 7.8 m |

## B. GEOMETRICS - HORIZONTAL CURVES:

(SOURCE: http://www.ncees.org/exams/study_materials/land_surveying_equations.pdf )

### HORIZONTAL CURVE FORMULAS

D = Degree of Curve, Arc Definition
1° = 1 Degree of Curve
2° = 2 Degrees of Curve
P.C. = Point of Curve
P.T. = Point of Tangent
P.I. = Point of Intersection
I = Intersection of Angle; Angle between two tangents
L = Length of Curve, from P.C. to P.T.
T = Tangent Distance
E = External Distance
R = Radius
L.C. = Length of Long Chord
M = Length of Middle Ordinate
c = Length of Sub-Chord
$\ell$ = Length of Arc for Sub-Chord
d = Angle of Sub-Chord




$$R = \frac{L.C.}{2\ \sin(I/2)};\quad T = R\tan(I/2) = \frac{L.C.}{2\cos(I/2)}$$

$$\frac{L.C.}{2} = R\sin(I/2);\quad D1° = R = 5{,}729.58;\quad D2° = \frac{5{,}729.58}{2};\quad D = \frac{5{,}729.58}{R}$$

$$M = R[1-\cos(I/2)] = R - R\cos(I/2)$$

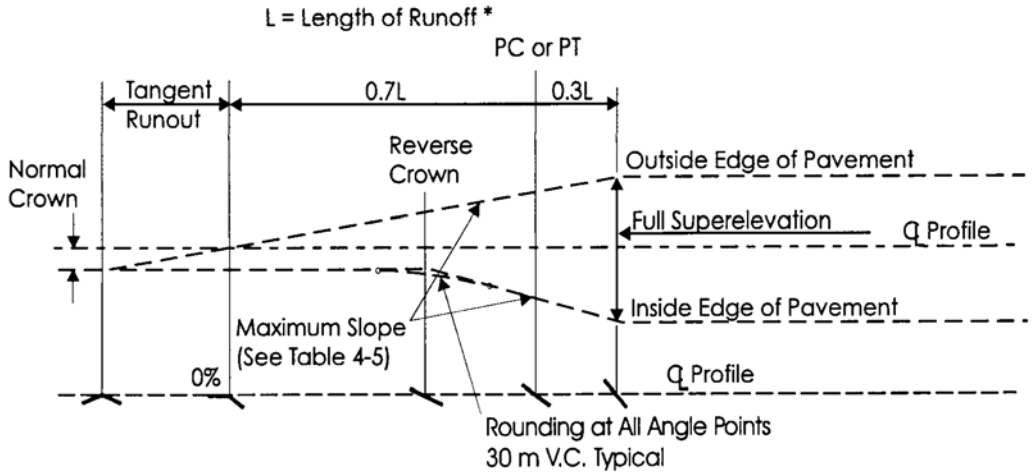
$$\frac{E+R}{R} = \sec(I/2);\quad \frac{R-M}{R} = \cos(I/2)$$

$$c = 2R\sin(d/2);\quad d = \frac{\ell D}{100}$$

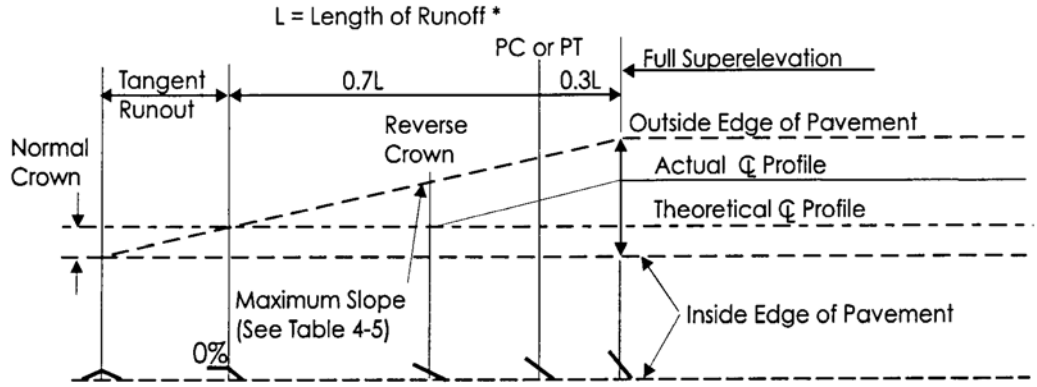
$$L.C. = 2R\sin(I/2);\quad E = R[\sec(I/2)-1] = R\sec(I/2) - R$$

## B GEOMETRICS - HORIZONTAL CURVES (Continued):

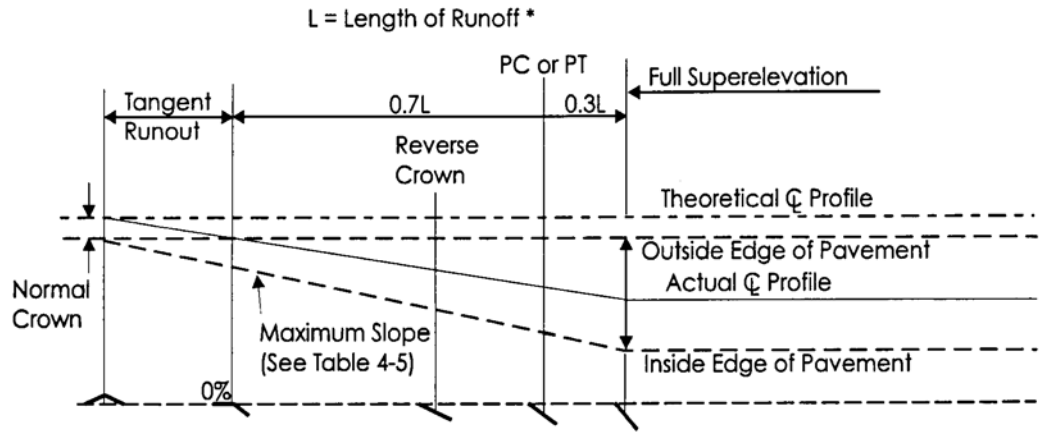
**SIMPLE CURVE SUPERELEVATION TRANSITIONS**
(SOURCE: Figure 4-10 NHDOT Highway Design Manual – March 1999)




PAVEMENT REVOLVED ABOUT CENTERLINE




PAVEMENT REVOLVED ABOUT INSIDE EDGE




PAVEMENT REVOLVED ABOUT OUTSIDE EDGE

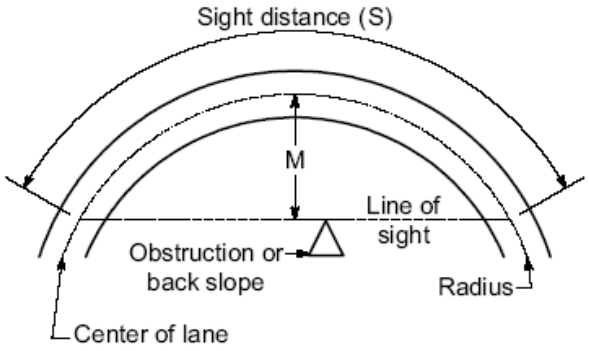
* A 70% - 30% split about the P.C. or P.T. is the normal distribution.
See the "Green Book" (8) for additional guidance.

## B. GEOMETRICS - HORIZONTAL CURVES (Continued):

(SOURCE: http://www.wsdot.wa.gov/EESC/Design/DesignManual)

Height of eye: 3.50 ft
Height of object: 0.50 ft

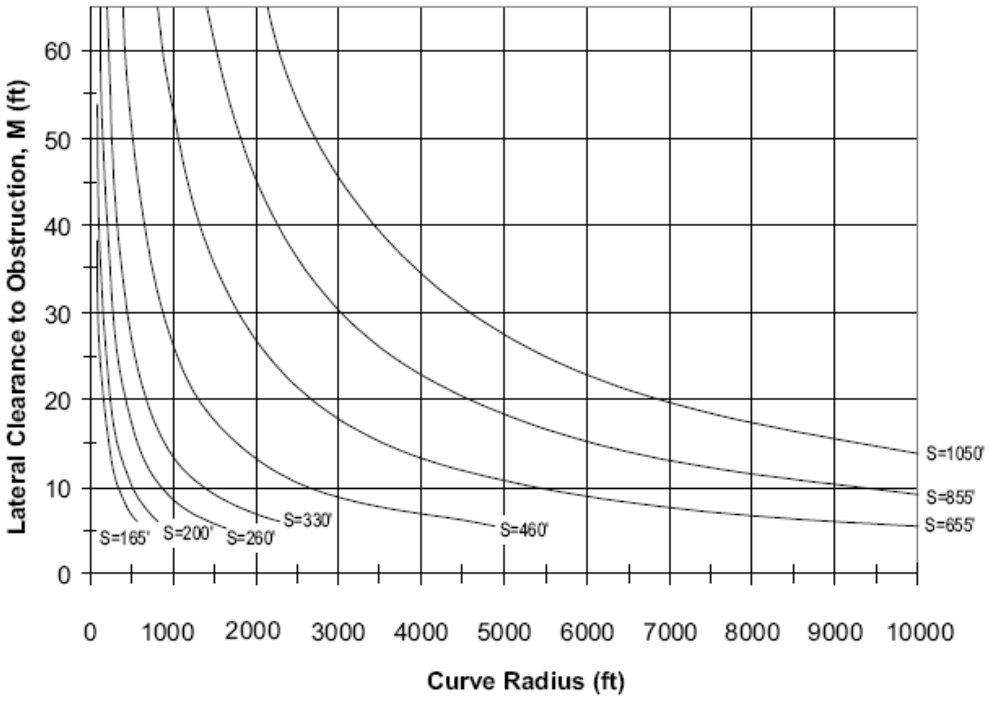
- Line of sight is normally 2.00 ft above center line of inside lane at point of
- obstruction provided no vertical curve is present in horizontal curve.




$$M = R\left(1 - \cos\frac{28.65\ S}{R}\right)$$

$$S = \frac{R}{28.65}\left[\cos^{-1}\left(\frac{R-M}{R}\right)\right]$$

S ≤ Length of curve
Angle is expressed in degrees

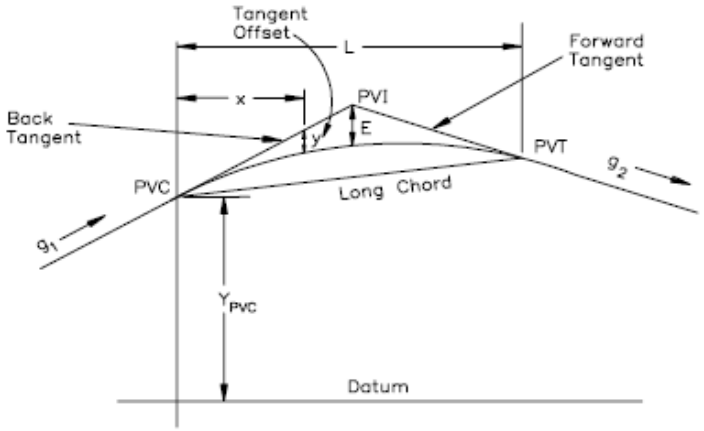



**Horizontal Stopping Sight Distance**
***Figure 650-9***

## C. GEOMETRICS - VERTICAL CURVES:

(SOURCE: http://www.ncees.org/exams/study_materials/land_surveying_equations.pdf )

### ENGLISH UNIT FORMULAS
### VERTICAL CURVE FORMULAS




VERTICAL CURVE FORMULAS
NOT TO SCALE

L = Length of Curve
PVC = Point of Vertical Curvature
PVI = Point of Vertical Intersection
PVT = Point of Vertical Tangency
$g_1$ = Grade of Back Tangent
$g_2$ = Grade of Forward Tangent
a = Parabola Constant
y = Tangent Offset
E = Tangent Offset at PVI
r = Rate of Change of Grade

$$y = ax^2$$

$$E = a\left(\frac{L}{2}\right)^2;$$

$$a = \frac{g_2 - g_1}{2L}$$

$$r = \frac{g_2 - g_1}{L}$$

Tangent Elevation $= Y_{PVC} + g_1x$
Grade Elevation $= Y_{PVC} + g_1x + ax^2$

NOTE: Distances x and L are in stations (i.e. 5+00 stations or 5 stations, not 500 feet)

**High and Low Point Formula:**

X = distance in stations from PVC to high/low point of curve.
$X = g_1L / (g_1 - g_2)$

**Example (English Units):**

If: $g_1$ = + 3.0%, $g_2$ = - 2.4%, L = 600 ft, PVI is @ sta 46+70 @ elev. 853.48.
Find: The PVC, PVT, intermediate, and high point stations and elevations (curve is an equal tangent curve).

Stationing:

PVI = 46 + 70
- L/2 = 3 + 00
PVC = 43 + 70
+ L = 6 + 00
PVT = 49 + 70

Elevation at PVC:

$Y_{PVC} = 853.48 – 3.00(3) = 844.48$

Calculate elevations at even stations:

r = (-2.4 – 3.0) / 6 stations = -0.9 % / station
$Y = Y_{PVC} + g_1x + ax^2 = Y_{PVC} + g_1x + rx^2/2$ (see table below):

**TABLE FOR VERTICAL CURVE EXAMPLE**

| STATION | x | $g_1x$ | $Rx^2/2$ | CURVE ELEVATION (Y) |
|---|---|---|---|---|
| 49+70 (PVT) | 6.0 | 18.00 | -16.20 | 846.28 |
| 49+00 | 5.3 | 15.90 | -12.64 | 847.74 |
| 48+00 | 4.3 | 12.90 | -8.32 | 849.06 |
| 47+00 | 3.3 | 9.90 | -4.90 | 849.48 |
| 46+00 | 2.3 | 6.90 | -2.38 | 849.00 |
| 45+00 | 1.3 | 3.90 | -0.76 | 847.62 |
| 44+00 | 0.3 | 0.90 | -0.04 | 845.34 |
| 43+70 (PVC) | 0.0 | 0.00 | 0.00 | 844.48 |
| Check EVC = 853.48 – 2.40(3) =846.28 | | | | |

Calculate high point information:

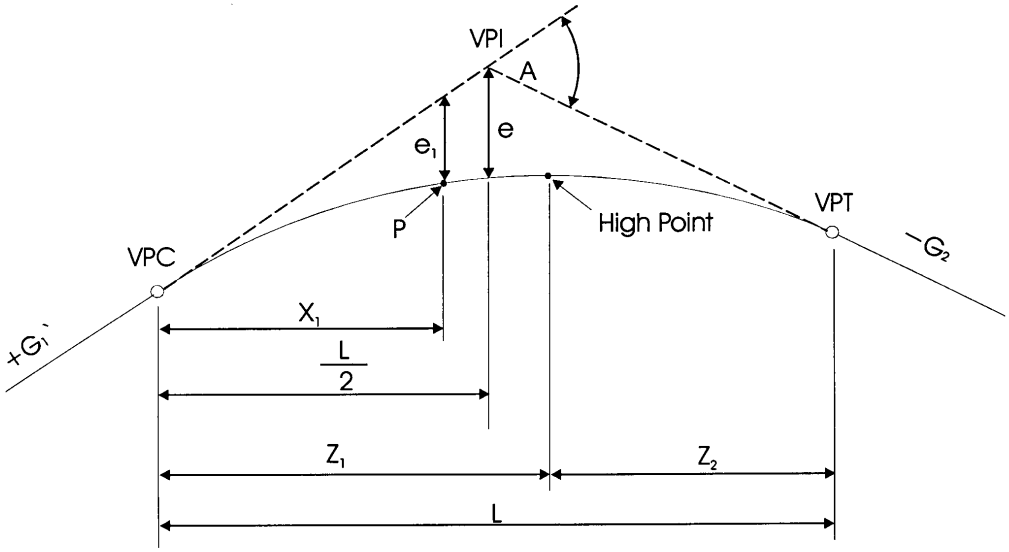
$X = g_1L / (g_1 – g_2) = 3.00(6) / (3.00 – (-2.4)) = 3.3333$ stations
$Sta_{high} = 43+70 + (3+33.33) = 47 + 03.33$
$Y_{high} = Y_{PVC} + g_1x + rx^2/2 = 844.48 + 3.00(3.3333) – 0.9\ (3.3333)^2/2 = 849.48$

Note: It is important that correct algebraic signs be used in all of the equations above.

## C. GEOMETRICS - VERTICAL CURVES (Continued):

(SOURCE: Figure 4-13 NHDOT Highway Design Manual – March 1999)

### METRIC FORMULAS




$$e = \frac{(G_1 - G_2)\,L}{800}$$

$$e_1 = e\,\frac{X_1^2}{(L/2)^2}$$

$$K = \frac{L}{A}$$

$$Z_1 = G_1\left(\frac{L}{A}\right)$$

$$Z_2 = G_2\left(\frac{L}{A}\right)$$

e = MIDDLE ORDINATE DISTANCE at V.P.I. (meters)
L = LENGTH OF VERTICAL CURVE (meters)
$G_1$ AND $G_2$ = TANGENT GRADES ( ± percent)
P = ANY POINT ON THE VERTICAL CURVE
$X_1$ = HORIZONTAL DISTANCE FROM V.P.C. TO P (meters)
$e_1$ = VERTICAL OFFSET DISTANCE (meters)
A = ALGEBRAIC DIFFERENCE IN GRADES (percent)
K = RATE OR VERTICAL CURVATURE
$Z_1$ AND $Z_2$ = DISTANCE TO HIGH OR LOW POINT

**Example (Metric Units):**

If $G_1$ = + 3.0%, $G_2$ = - 2.5%, and L = 300 m
Then K = 300/5.5 = 55

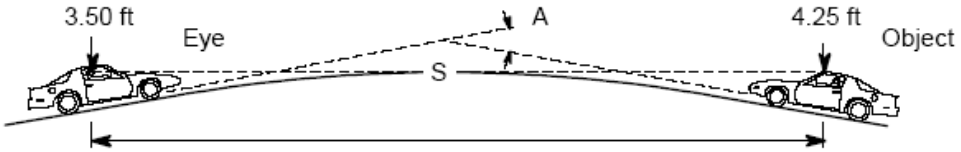
$$e = \frac{(3.0 - (-2.5))\,(300)}{800} = 2.063 \text{ m}$$

$e_1$ at 100 m from the VPC = $2.063\ ((100)^2/(150)^2) = 0.917$ m

$Z_1 = 3.0\ (55) = 165$ m

## C. GEOMETRICS - VERTICAL CURVES – ENGLISH (Continued):

(SOURCE: http://www.wsdot.wa.gov/EESC/Design/DesignManual)




Formulas:

When S is less than L

$L = AS^2/3093$

When S is greater than L

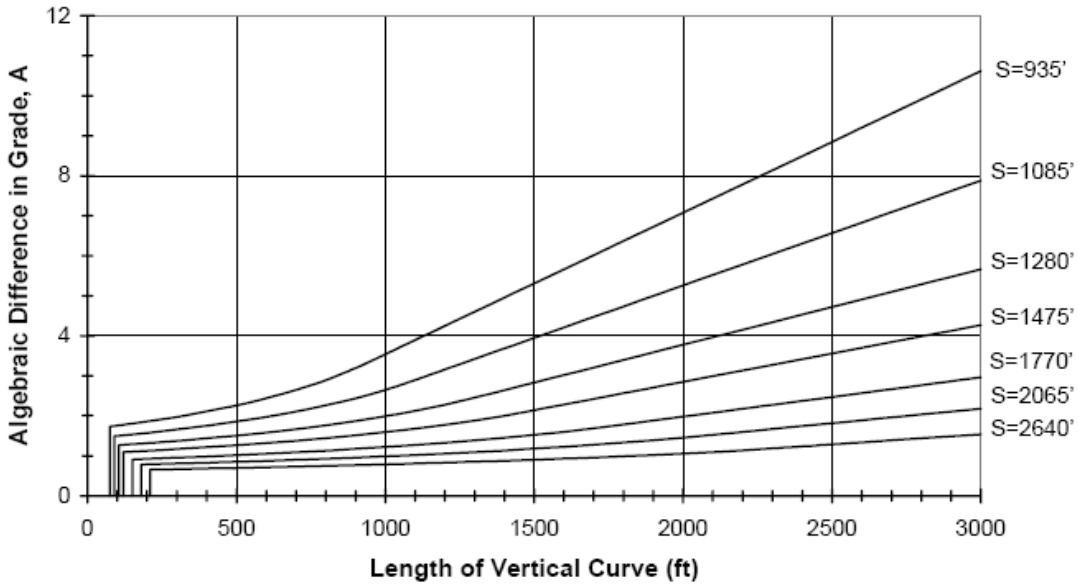
$L = 2S - 3093/A$

---

S = Sight distance in feet

L = Length of vertical curve in feet

A = Algebraic difference of grades in percent

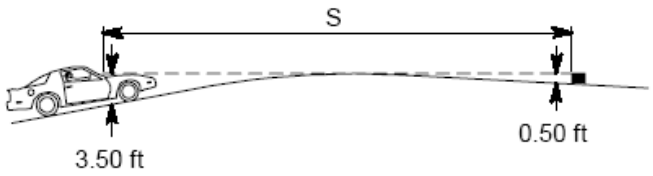



**Passing Sight Distance for Crest Vertical Curves**

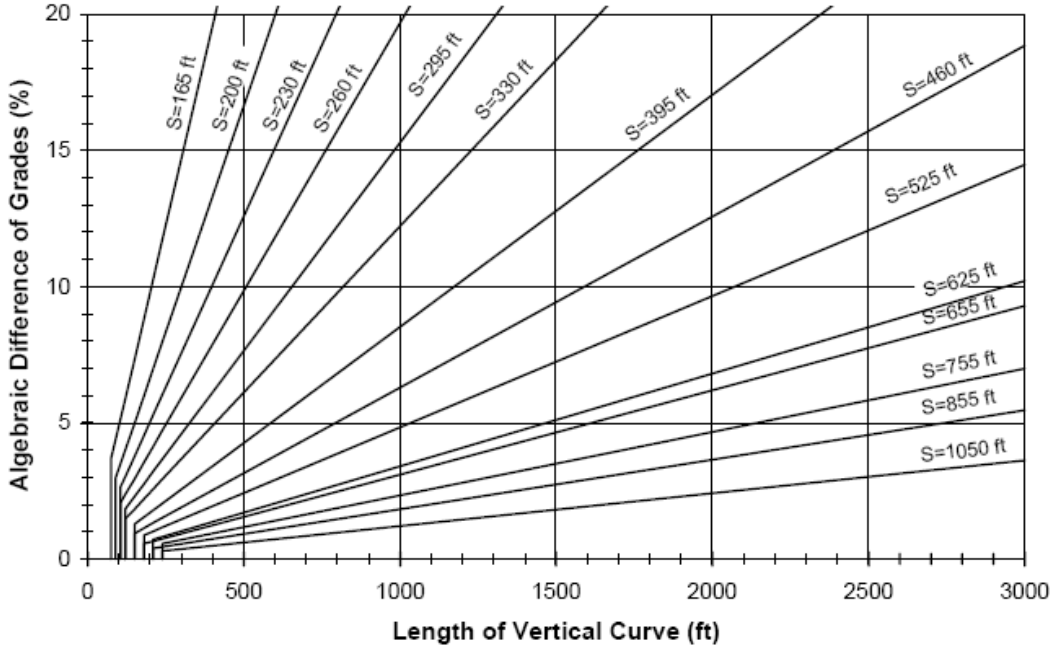
***Figure 650-6***

## C. GEOMETRICS - VERTICAL CURVES – ENGLISH (Continued):

(SOURCE: http://www.wsdot.wa.gov/EESC/Design/DesignManual)



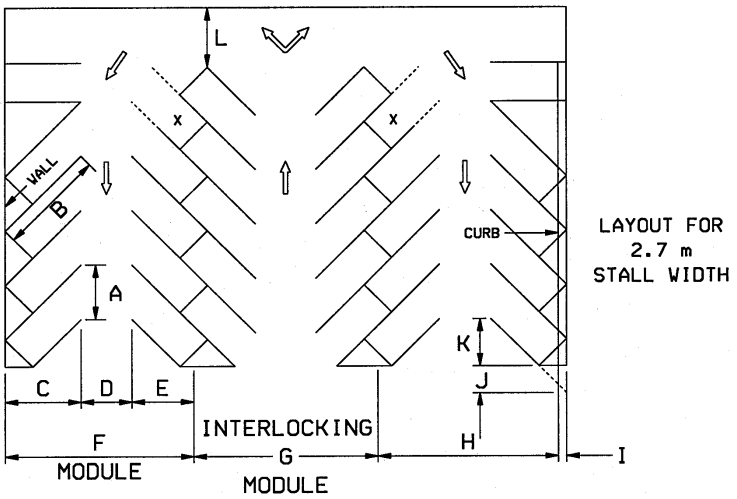

| When S > L | When S < L |
|---|---|
| $L = 2S - 1329/A$ (not used in figure) | $L = AS^2/1329$ |
| L = Curve length (ft)<br>A = Algebraic grade difference (percent)<br>S = Sight distance (ft) | |




**Stopping Sight Distance for Crest Vertical Curves**
***Figure 650-7***

## D. GEOMETRICS – PARKING LOT LAYOUT:

(SOURCE: Appendix 5-6, NHDOT Highway Design Manual - March 1999)




STALL LAYOUT ELEMENTS
X = STALL NOT USEABLE IN CERTAIN LAYOUTS

| DIMENSION | DIAGRAM | 45$^0$ | 60$^0$ | 75$^0$ | 90$^0$ |
|---|---|---|---|---|---|
| STALL WIDTH PARALLEL TO AISLE | A | 12.5 (3.85) | 10.5 (3.15) | 9.5 (2.85) | 9.0 (2.70) |
| STALL LENGTH OF LINE | B | 25.0 (7.50) | 22.0 (6.60) | 20.0 (6.00) | 18.7 (5.70) |
| STALL DEPTH TO WALL | C | 17.5 (5.35) | 19.0 (5.75) | 19.5 (5.95) | 18.7 (5.70) |
| AISLE WIDTH BETWEEN STALL LINES | D | 12.0 (3.60) | 15.5 (4.80) | 23.0 (6.90) | 25.5 (7.80) |
| STALL DEPTH, INTERLOCK | E | 15.25 (4.65) | 17.5 (5.35) | 19.0 (5.75) | 18.7 (5.70) |
| MODULE, WALL TO INTERLOCK | F | 44.5 (13.60) | 52.0 (15.85) | 61.0 (18.60) | 63.0 (19.20) |
| MODULE, INTERLOCKING | G | 42.3 (12.90) | 51.0 (15.50) | 60.5 (18.40) | 63.0 (19.20) |
| MODULE, INTERLOCK TO CURB FACE | H | 42.7 (13.00) | 49.7 (15.15) | 58.5 (17.85) | 60.5 (18.45) |
| BUMPER OVERHANG (TYPICAL) | I | 2.0 (0.60) | 2.3 (0.70) | 2.5 (0.75) | 2.5 (0.75) |
| OFFSET | J | 6.2 (1.90) | 2.6 (0.80) | 0.5 (0.15) | 0 |
| SETBACK | K | 11.0 (3.30) | 8.2 (2.50) | 5.0 (1.50) | 0 |
| CROSS AISLE, ONE WAY | L | 14.0 (4.2) | 14.0 (4.2) | 14.0 (4.2) | 14.0 (4.2) |
| CROSS AISLE, TWO-WAY | - | 24.0 (7.2) | 24.0 (7.2) | 24.0 (7.2) | 24.0 (7.2) |

Parking layout dimensions for 9.0 ft (2.7 m) stalls at various angles

| PARKING ANGLE (DEGREES) | A STALL WIDTH PARALLEL TO AISLE ft (m) | C STALL DEPTH TO WALL ft (m) | E STALL DEPTH TO INTERLOCK ft (m) | D AISLE WIDTH ft (m) | MODULES 2C+D WALL TO WALL ft (m) | MODULES G INTERLOCK TO INTERLOCK ft (m) |
|---|---|---|---|---|---|---|
| 45 | | | | | | |
| 8.0 ft (2.5 m) STALL | 12.0 (3.60) | 17.5 (5.35) | 15.25 (4.65) | 13.0 (3.90) | 48.0 (14.60) | 43.5 (13.20) |
| 9.0 ft (2.7 m) STALL | 12.5 (3.85) | 17.5 (5.35) | 15.25 (4.65) | 12.0 (3.60) | 47.0 (14.30) | 42.5 (12.90) |
| 9.5 ft (2.9 m) STALL | 13.5 (4.10) | 17.5 (5.35) | 15.25 (4.65) | 11.0 (3.30) | 46.0 (14.00) | 41.5 (12.60) |
| 60 | | | | | | |
| 8.0 (2.5) STALL | 10.0 (3.00) | 19.0 (5.75) | 17.5 (5.35) | 17.5 (5.40) | 55.5 (16.90) | 53.0 (16.10) |
| 9.0 (2.7) STALL | 10.5 (3.15) | 19.0 (5.75) | 17.5 (5.35) | 15.5 (4.80) | 53.5 (16.30) | 51.0 (15.50) |
| 9.5 (2.9) STALL | 11.0 (3.30) | 19.0 (5.75) | 17.5 (5.35) | 14.5 (4.50) | 52.5 (16.00) | 50.0 (15.20) |
| 75 | | | | | | |
| 8.0 (2.5) STALL | 9.0 (2.70) | 19.5 (5.95) | 19.0 (5.75) | 24.5 (7.50) | 63.5 (19.40) | 62.5 (19.00) |
| 9.0 (2.7) STALL | 9.5 (2.85) | 19.5 (5.95) | 19.0 (5.75) | 22.5 (6.90) | 61.5 (18.80) | 60.5 (18.40) |
| 9.5 (2.9) STALL | 10.0 (3.00) | 19.5 (5.95) | 19.0 (5.75) | 21.5 (6.60) | 60.5 (18.50) | 59.0 (18.10) |
| 90 | | | | | | |
| 8.0 (2.5) STALL | 8.5 (2.60) | 18.7 (5.70) | 18.7 (5.70) | 27.5 (8.40) | 65.0 (19.80) | 65.0 (19.80) |
| 9.0 (2.7) STALL | 9.0 (2.70) | 18.7 (5.70) | 18.7 (5.70) | 25.5 (7.80) | 63.0 (19.20) | 63.0 (19.20) |
| 9.5 (2.9) STALL | 9.5 (2.90) | 18.7 (5.70) | 18.7 (5.70) | 24.6 (7.50) | 62.0 (18.90) | 62.0 (18.90) |

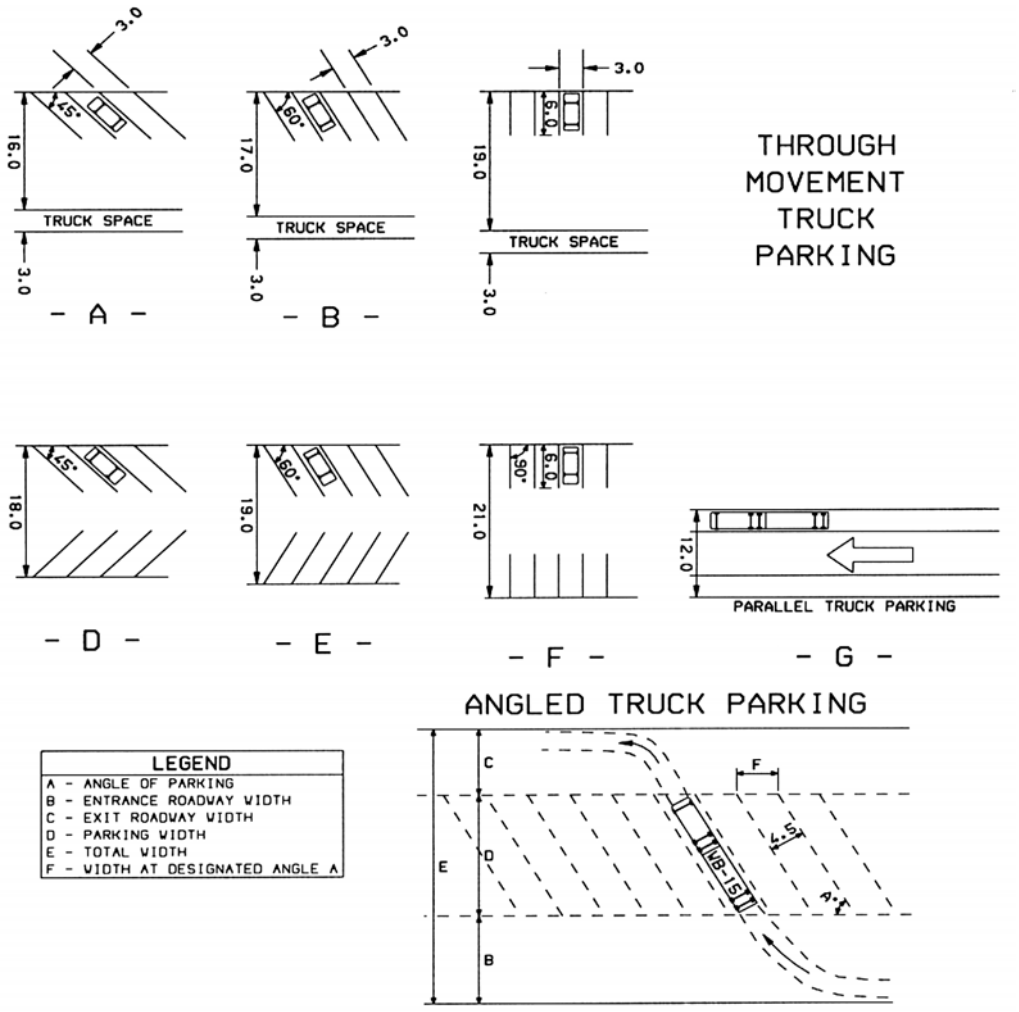
Dimensions for variable stall widths 8 to 9.5 ft (2.5-2.9m)

NOTES:

1. THESE DIMENSIONS ARE FOR 18.7 FT (5.7 M) STALL, MEASURED PARALLEL TO VEHICLE, AND ARE BASED ON RESULTS OF A SPECIAL STUDY TO EVALUATE THE EFFECTS OF VARIED AISLE AND STALL WIDTH FOR THE DIFFERENT PARKING ANGLES SHOWN. THE STUDY WAS CONDUCTED IN DECEMBER OF 1970 BY THE FEDERAL HIGHWAY ADMINISTRATION AND PAUL C. BOX ASSOCIATES
2. THE VALUES GIVEN ABOVE ARE **APPROXIMATE** CONVERSIONS FROM THE ORIGINAL ENGLISH UNITS STUDY TO METRIC UNITS IN THE 1999 HIGHWAY DESIGN MANUAL. THEY WERE CONVERTED BACK TO ENGLISH VIA A "HARD" CONVERSION FROM THE METRIC VALUES ABOVE FOR THE 2005 CONSTRUCTION MANUAL.

## D. GEOMETRICS- PARKING LOT LAYOUT (Continued):

(SOURCE: Appendix 5-7 NHDOT Highway Design Manual - March 1999)




| DETAIL FOR PARKING SPACE (Based on WB-15 design vehicle) | | | | | |
|---|---|---|---|---|---|
| ANGLE OF PARKING (DEGREES) | ENTRANCE ROADWAY WIDTH FT (METERS) | EXIT ROADWAY WIDTH FT (METERS) | PARKING WIDTH FT (METERS) | TOTAL WIDTH PARKING AREA FT (METERS) | |
| A | B | C | D | E | F |
| 30 | 20 (6.0) | 20 (6.0) | 35 (10.5) | 75 (22.5) | 30 (9.0) |
| 45 | 30 (9.0) | 25 (7.5) | 50 (15.0) | 105 (31.5) | 21 (6.5) |
| 60 | 40 (12.0) | 30 (9.0) | 55 (16.5) | 125 (37.5) | 17 (5.3) |

**Note:** The values given in the table above were a "hard" conversion from metric to English units. The numbers on the figure above are in metric (i.e. 4.5 = 4.5m = 15 ft).

# WEIGHTS OF MATERIALS:

| WEIGHTS OF COMMON MATERIALS | | |
|---|---|---|
| Material | pcf | (kg/m3) |
| Aluminum: | | |
| Cast | 165 | (2643) |
| Wire | 168 | (2691) |
| Asphalt | 60-80 | (961-1281) |
| Rolled *(lbs per s.y. per inch)* | *100-110* | |
| Brass | 510-542 | (8169-8682) |
| Brick | 110-130 | (1762-2082) |
| Cement, Portland ( 1 cf bag) | 94 | (1506) |
| Coal, piled: | | |
| Antrhacite | 47-58 | (753-929) |
| Bituminous | 40-54 | (641-865) |
| Concrete: | | |
| Reinforced | 150 | (2403) |
| Plain | 140-150 | (2243-2403) |
| Concrete Aggregate | | |
| Dry, rodded | 100-105 | (1602-1682) |
| Copper, cast | 549-558 | (8794-8938) |
| Earth: | | |
| Clay: | | |
| Dry | 63 | (1009) |
| Dry, compacted | 100 | (1602) |
| Damp | 110 | (1762) |
| Common: | | |
| Dry, loose | 76 | (1217) |
| Dry, compacted | 95 | (1522) |
| Moist, loose | 78 | (1249) |

| WEIGHTS OF COMMON MATERIALS | | |
|---|---|---|
| Material | pcf | (kg/m3) |
| Gravel | | |
| Crushed rock, damp, loose | 82-125 | (1314-2002) |
| Cr. rock, dry, compacted | 90-145 | (1442-2323) |
| Stony, loose in truck | *3200 lbs/cy* | |
| Stony, compacted in road | *3800 lbs/cy* | |
| Ice: | 56 | (897) |
| Iron: | | |
| Grey cast | 439-445 | (7032-7128) |
| Wrought | 487-492 | (7801-7881) |
| Lead | 710 | (11373) |
| Lime | 53-75 | (849-1201) |
| Masonry: | | |
| Mortar rubble | 155 | (2483) |
| Dry rubble | 125 | (2002) |
| Rock, solid: | | |
| Granite | 125-187 | (2002-2995) |
| Shale | 162 | (2595) |
| Soapstone | 162-175 | (2595-2803) |
| Trap | 187-190 | (2995-3044) |
| Salt, granulated | 50-70 | (801-1121) |
| Snow: | | |
| Fresh, fallen | 5-12 | (80-192) |
| Wet, compact | 15-20 | (240-320) |
| Steel | 474-494 | (7593-7913) |
| Tar | 75 | (1201) |
| Tin | 455 | (7288) |

| | | |
|---|---|---|
| Moist, compacted | 96 | (1538) |
| River mud | 90 | (1442) |
| Sand: | | |
| Wet, loose - 4% moist. | 89 | (1426) |
| Dry, loose | 100 | (1602) |
| Dry, rodded | 105 | (1682) |

| | | |
|---|---|---|
| Water: | | |
| Fresh | 62.4 | (1000) |
| Fresh | *8.33 lbs / gallon* | |
| Fresh | *7.5 gallons / cubic foot* | |
| Sea | 64 | (1025) |
| Zinc | 438 | (7016) |

NOTE: All weights listed above are approximate.

## BEARING CAPACITIES:

**BEARING CAPACITIES OF SOIL**

| Material | Bearing Value | | |
|---|---|---|---|
| | Tons per sq ft | PSF | (kg/m2) |
| Clay, soft | 1 | 2,000 | (9,764) |
| Clay, hard | 6 | 12,000 | (58,584) |
| Clay, medium | 4 | 8,000 | (39,056) |
| Sand and clay mixed | 2 | 4,000 | (19,528) |
| Sand, fine, loose | 1 | 2,000 | (9,764) |
| Sand, coarse, loose | 3 | 6,000 | (29,292) |
| Sand (dry), fine, compact | 3 | 6,000 | (29,292) |
| Sand (dry), coarse, compact | 4 | 8,000 | (39,056) |
| Sand and gravel mixed (loose) | 4 | 8,000 | (39,056) |
| Sand and gravel mixed (compact) | 5 | 10,000 | (48,820) |
| Gravel, compact | 6 | 12,000 | (58,584) |
| Rock, soft | 8 | 16,000 | (78,112) |
| Rock, medium | 15 | 30,000 | (146,460) |
| Rock, hard | 35 | 70,000 | (341,740) |
| Hardpan | 10 | 20,000 | (97,640) |
| Shale, in sound condition | 10 | 20,000 | (97,640) |

SOURCE: N.Foster, *Practical Tables for Building Construction.*


"This table is approximate only. The actual bearing capacity of soils depends on the composition, the moisture content, and the extent of the strata. Local building codes usually give the allowable bearing capacity of soils" (Parmley, Robert O., *Field Engineer's Manual, 2nd Edition,* ).

# TRAFFIC CONTROL CHECKLIST:

(SOURCE: Bureau of Traffic, Concord, NH)

## Portable Changeable Message Sign (PCMS)

- ❑ Shall only contain two phases (messages) and the message shall not duplicate a construction sign in the same vicinity.
- ❑ If more than two messages are needed, use additional PCMS
- ❑ Message shall consist of up to three lines eight characters per line
- ❑ Message can use abbreviations as noted in MUTCD Section 1A.14
- ❑ Message shall be visible a minimum distance of 650 ft and the PCMS shall have adjustable display rates so the entire message can be read at least twice when driving at the posted speed limit.
- ❑ Message shall not scroll or travel horizontally or vertically across the face of the sign.
- ❑ Shall be mounted at least 7 ft above the EP in urban areas and divided highways and a minimum height of 5 ft in rural areas.
- ❑ Shall be delineated with TC devices (barrels)
- ❑ The PCMS trailer should be delineated on a permanent basis by affixing retroreflective material (white/red vehicle sheeting).
- ❑ Per 619.3.2.6.3 when a PCMS is not in use, it shall be removed from the clear zone unless adequately protected by portable barrier or equivalent and specifically approved.
- ❑ When PCMS are not in use, the message board should be turned parallel to traffic.
- ❑ PCMS shall be placed so it will not block other signs or be blocked by other signs, vegetation, etc.
- ❑ All letters shall be at least 18 in.

## Permanent Construction Signs

- ❑ Always listed on the Construction Signs and Warning Devices (CSWD) summary sheet which is included in the project plans or proposal.
- ❑ Refer to Work Zone Traffic Control Standard Plans #2 for typical sign layout. Signs shall not block other roadway signs see note #2 on WZTC-1
- ❑ Sign text shall follow the NHDOT Construction Sign Standards and Standard Highway Signs.
- ❑ Shall always be fluorescent orange sheeting and shall be 48”x48” signs unless in urban areas or so noted on the CSWD summary sheet.
- ❑ Shall be mounted on two u-channels posted unless noted differently on the CSWD summary sheet.
- ❑ Post shall be flush with the top of the sign or 6 inches below the sign. Post extended over the sign is unaccepted.
- ❑ Splicing of U-channel is allowed per NCHRP 350 testing typically 6”
- ❑ Post shall be embedded at a depth of 2.5
- ❑ Signs shall be mounted at a height of 7 ft off EP in urban areas and divided highways. In rural areas sign can be mounted at a minimum height of 5 ft of the EP.
- ❑ Sign not in use shall be removed or covered completely with an approved material i.e. plywood.

## Channelizing Devices

- ❑ Space for tangent use is twice the speed limit
- ❑ Spacing on tapers is the speed limit

### A. Cones

- ❑ Can be used at night only during work hours. Non-work hours cones can be used at night only to supplement other channelizing devices i.e. drums or barricades. The drums & barricades shall still be spaced per the required spacing.
- ❑ Cones used at night shall be at least 28” in height and shall have two retroreflective bands around the cone. One (1) – 6” band located 3” to 4” from the top of the cone and another 4” band located 2” below the 6” band.

### B. Drums

- ❑ Drums shall be predominately orange per new WZTC-1.
- ❑ 36” minimum height
- ❑ Shall have alternating orange and white retroreflective stripes 4” to 6” wide.
- ❑ Shall have two orange and white stripes with the top stripe being orange.
- ❑ Spaces between the stripes shall not exceed 3 inches.
- ❑ Ballast shall not be placed on top of the drum.

## TRAFFIC CONTROL CHECKLIST (Continued):

(SOURCE: Bureau of Traffic, Concord, NH)

**C. Barricades**

- ❑ Stripes on barricades shall be alternating orange and white retroreflective sloping downward at an angle of 45º in the direction road users are to pass.
- ❑ Stripes shall be 6 inches wide except when rail lengths are less than 3 ft, 4 inch stripes may be used.
- ❑ Type I and II are intended to be used in situations to direct the road users through a work zone.
- ❑ Type I typically are used on conventional roads or urban streets.
- ❑ Type II typically are used on Divided Highways or other high speed roadways (greater than 45 mph).
- ❑ Type III are primarily used for road closures or partial closures.
- ❑ Rails are 8" – 12" wide
- ❑ Type I & II rails are 24" minimum in length and the height to the top of rail from the ground is minimum 36".
- ❑ Type III rail length is a minimum 4 ft with a minimum height of 5 ft from top of rail to the ground.

### Operational Construction Signs

- ❑ Signs shall be mounted on an approved NCHRP 350 portable sign stand and the bottom of the sign shall be mounted a minimum 1 ft above the travelway.
- ❑ Cold planned areas shall always have the following signs: Motorcycles Use Caution, Grooved Pavement Ahead, Bump or Dip
- ❑ "Be Prepared to Stop" sign should be used along with a "Flagger" sign

### Flaggers

- ❑ Check for Flagger Certification
- ❑ Flagger vest apparel shall meet the MUTCD requirements
- ❑ Flagger stop/slow paddle shall be 18 in wide with 6" letters and be retroreflective
- ❑ "Flagger Ahead" and "Be Prepared To Stop" signs in place and removed if no longer needed.
- ❑ Proper Flagger clothing: hard hat or orange baseball cap, shirt, & safety vest
- ❑ Flagger stations shall be clean and without distractions i.e. books, chairs, radios, personnel congregating. Flaggers are allowed to use 2-way radios to control traffic.
- ❑ Flagger station shall be on the shoulder of the approaching traffic outside of the lane closure per MUTCD and NHDOT Flagger Handbook. Flagger **shall not** be stationed in the travel lane.
- ❑ Flagger stationing shall be reviewed throughout the day for adequate lighting and shadows that may damper their visibility.
- ❑ Flagger shall not leave their station for any reason such as picking up signs, barrels, cones, etc.
- ❑ Are flaggers using proper flagging etiquette and conducting themselves appropriately to send a clear, respectful message to passing drivers?
- ❑ Signaling with hand signals and stop/slow paddles shall follow the NHDOT Flagger handbook and the MUTCD.
- ❑ Flagger shall **never** flag from inside a vehicle.
- ❑ Flagger shall be informed on what to do if approached by emergency vehicles, in the event of accidents or a vehicle running the flagger station.
- ❑ The Contractor shall allow for proper rest breaks, explain the traffic control operation to the flagger and check the visibility of the signs and flaggers on the work area.

### Pre Construction Meeting

- ❑ Determine who the contractor's traffic control coordinator is.
- ❑ Make sure that the proper traffic control documents are being used.
- ❑ Review NCHRP 350 requirements with the contractor.
- ❑ Discuss possible locations for Portable Changeable Message Signs reminding the Contractor that they must be outside the clear zone when not in use.
- ❑ Review the layout, or perform the layout prior to erecting the permanent construction signs. Approve only the final product, not the layout.
- ❑ Encourage the Contractor to have the proper operational signs on site to use in case of emergencies/unforeseen circumstance.
- ❑ Inspect the following before implementation:
  - Sign sheeting intensity, wording, text, size, etc.
  - Proper posts
  - Condition of channelizing devices
  - Check the working conditions of arrow boards and portable changeable message signs.

## TRAFFIC CONTROL CHECKLIST (Continued):

(SOURCE: Bureau of Traffic, Concord, NH)

### Pavement Markings (Reference Spec 632, 619, & NHDOT WZTC Standard Plans)

- ❑ Temporary pavement markings can be paint, tape or removable raised pavement markers.
- ❑ Temporary pavement markings are the markings installed on an interim base prior to final pavement markings. Pavement markings installed on detours or winter binder pavement are not considered temporary pavement markings. These markings are paid for under Item 632 and shall follow those specifications.
- ❑ Temporary pavement markings shall not be in place for more than 2 weeks, except for temporary raised pavement markers on divided highways, which shall not be in place for more than 1 week.
- ❑ All temporary pavement markings shall remain in place while in service and if dislodged or rendered ineffective the temporary markings shall be replaced.
- ❑ Temporary raised pavement markers shall not be used to supplement or substitute edge lines and non-longitudinal lines e.g. stop lines, railroad crossings, crosswalks, words, symbols, etc.
- ❑ Edgelines, channelizing lines, lane reduction transitions, gore markings, and non-longitudinal lines are usually not required for temporary pavement unless directed by the Engineer refer to NHDOT WZTC Standard plans.
- ❑ Raised Pavement Markers spacing for double yellow centerline on two-way roadways is 40 feet. At the Engineer's discretion, "Do Not Pass" (R4-1) signs may be installed for added emphasis. These markers shall be yellow double face retroreflectorized markers placed in pairs.
- ❑ Raised Pavement Markers on divided highways shall also be spaced at 40 feet for the single broken line. These markers shall be white single face retroreflectorized markers.
- ❑ Refer to the NHDOT Qualified Products List for approved raised pavement markers noted under 619 items.
- ❑ Pavement markings that are longer applicable to current condition in the work zone shall be completely removed so that they are not visible either during day or night.
- ❑ Perform occasioned drive throughs on the project during the day and night and determine if the markings are no longer visible or if the white markings appear to be white and yellow markings appear yellow, and if they are in "acceptable" condition, if not the Contractor shall repaint the lines.
- ❑ Prior to implementing a TC package and throughout construction, work zone drive through is important to verify that the markings are per the TCP.

**S:\C-MANUAL\final rewrites\Division 900 6-1-06.doc**

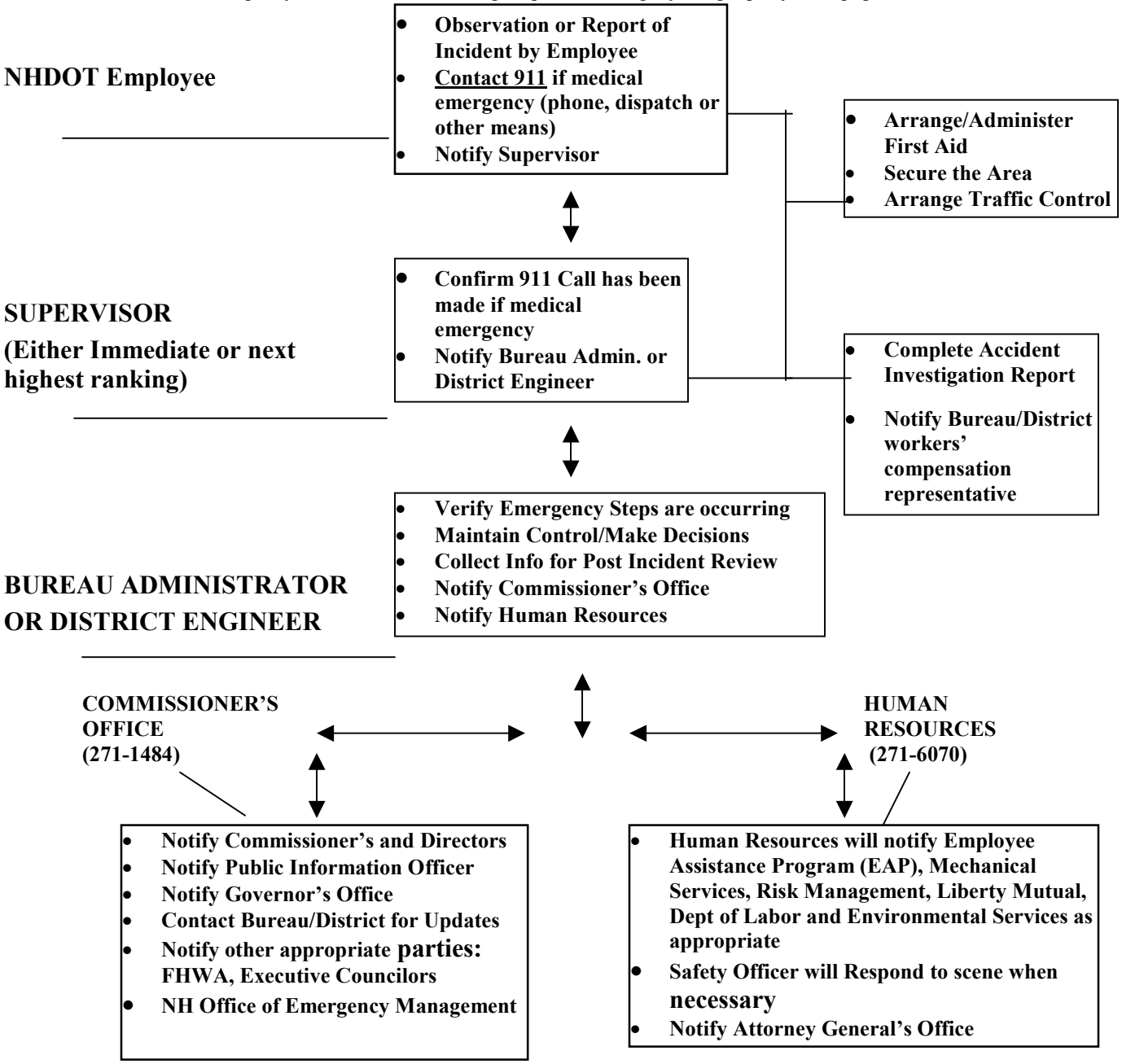
# ACCIDENTS - EMERGENCY NOTIFICATION PROCEDURE:

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

**Purpose**: To assure timely and informative notification in the event of an emergency/catastrophic situation that may involve:

1. Death, dismemberment or severe injury requiring hospitalization of DOT employees.
2. Death, dismemberment or severe injury to members of the public when DOT employee conduct may be a contributing factor.
3. Major property damage and/or loss of physical assets.
4. Bridge failure or road failure.
5. Severe/negative impact upon public relations.

**NOTE:** NHDOT employees are encouraged to act as Good Samaritans, using good judgment and common sense when confronted with emergency incidents not involving Department employees, property, or equipment.



# ACCIDENTS – ACCIDENT REPORT REQUEST:

**STATE OF NEW HAMPSHIRE**
**DEPARTMENT OF TRANSPORTATION**
**CONSTRUCTION BUREAU**

***Carol A. Murray***
***Commissioner***

July 23, 2005

*Ms. / Mr. / Officer XXXXX*
*ABCD Police Department*
*Police Dept. Mailing Address*

This is a sample request for a copy of a police accident report. Contact the local or state police department that responded to the accident to find a contact name to address the letter to and a fax number to send along the request. Make sure the letter includes: Your name and title; reason for the request; description of the accident; and mailing address. Make a note in the daily report when this request was made and keep a copy of this request and the subsequent report in the project files. Bear in mind that the officer may take 2 or 3 weeks to write the report. In any case, report all accidents to the Construction Bureau as soon as possible. State Police phone: 271-2128, fax: 271-1555.

**RE:** ***Project Name and Location***
**Request for Accident Report**

Dear *XXXXX*,

This letter is a request for a copy of the accident report for the accident that occurred within the N.H.D.O.T. project limits on Tuesday July 22, 2003 at ±2:15 PM. The accident took place at the intersection of Route *XY* and Route *YX*. A copy of the accident report is needed for the project records.

Please give me a call at XXX-XXXX *(field office or cell phone #)* if you have any questions. I would be happy to pick up the report at your earliest convenience after it is completed, or you may mail it to the address at the bottom of this letter, "Attention: Ronald Tanner – Construction Bureau." Thank you for your time and attention to this request.

Sincerely,

Ronald Tanner, P.E.
NHDOT Contract Administrator

Cc: District Construction Engineer

# SAFETY CONCERNS – CONSTRUCTION SITE HAZARDS:

The following is a partial list of common hazards that people new to construction may not be aware of. As a supervisor in the field, make sure that people who are under your supervision, or are visiting, are made aware of all relevant safety concerns.

- Competing Noise: You cannot rely on your ears to alert you of something that is approaching you when you are overwhelmed by loud machinery.
- No Backup Beeper: Some equipment such as an excavator can spin around so that the tracks go forward but the cab is going backward with no back up beeper on.
- Excavator Blind Spot: An excavator operator must rely on a mirror to see to the right of the boom. Make eye contact.
- Pavement Burns: Pavement may only feel warm, but it is ≥350 °F and will burn.
- Operator Eye Contact: The operators know where their workers are, but may not notice you. Make eye contact.
- Welder Blindness: Don't look or stare at the electric arc.
- Compressor Hoses: Hoses can move, rupture, or be a trip hazard.
- Stud Welding Cables: These lines are not always insulated properly. Do not be the ground for an electric current.
- Driving in Construction: A new person driving through construction is like a southerner driving in snow. It takes practice.
- Blasting Whistles: "That must be the lunch whistle."
- Unstable Rock: Walking on blasted rock, or class B stone etc., can be unstable.
- Face Traffic: While working in the road face traffic or have one person watching traffic at all times.
- Truck Loading: Don't walk beside a dump truck being loaded, material may spill over.
- Excavator/Crane Pinch: Pinch areas are usually, but not always, roped off.
- Cold Planer Jump Back: A cold planer may jump back if not properly set down while the drum is spinning.

- Rebar Impalement: OSHA safety caps should be on rebar, but sometimes are exposed.
- Unfinished Staging: An inspector may not know when staging is ready to be walked on.
-

## OSHA REQUIREMENTS:

(SOURCE: www.OSHA.gov)
http://www.osha-slc.gov/pls/oshaweb/owalink.query_links?src_doc_type=STANDARDS&src_unique_file=1926_0501&src_anchor_name=1926.501(b)(1)

**FALL PROTECTION:** (OSHA 1926.501 (b)(1)):
Each employee on a walking/working surface (horizontal and vertical surface) with an unprotected side or edge which is **6 feet** (1.8 m) or more above a lower level shall be protected from falling by the use of guardrail systems, safety net systems, or personal fall arrest systems.

**FALL PROTECTION:** (OSHA 1926.501 (b)(5)):
Each employee on the face of formwork or reinforcing steel shall be protected from falling **6 feet** (1.8 m) or more to lower levels by personal fall arrest systems, safety net systems, or positioning device systems.

**FALL PROTECTION:** (OSHA 1926.760 (a)(1)):
Each employee engaged in a **steel erection activity** who is on a walking/working surface with an unprotected side or edge more than **15 feet** (4.6 m) above a lower level shall be protected from fall hazards by guardrail systems, safety net systems, personal fall arrest systems, positioning device systems or fall restraint systems.

**TRENCH SAFETY:** (OSHA 1926.651(c)(2)):
A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are **≥4 feet** (1.22 m). The exit ladder must be **within 25 feet** (7.62 m) of all workers in the trench.

**TRENCH SAFETY:** (OSHA 1926.651(j)(2)):
Excavated materials must be at least **2 feet** (.61 m) away from the edge of the excavation or trench.

**TRENCH SAFETY:** (OSHA 1926.652(a), (b) & (c)):
Adequate protective systems (ex: trench boxes, shoring, sloping, stepped or benched grades) are required in excavations **≥5 feet** deep, unless in stable rock.

**TRENCH SAFETY:** (OSHA 1926.652 (b)(1)(i)):
If 5-foot trenches are not otherwise protected, the sides of the excavation shall be sloped no steeper than **1.5 H: 1 V.**

**TRENCH SAFETY:** (OSHA 1926.652 (e)(2)(i) & 1926.652 (g)(2)):

Excavation of material to a level no greater than **2 feet** (.61 m) below the bottom of the members of a support system or trench box shall be permitted and only if ground conditions are stable.

http://www.osha.gov/pls/oshaweb/owalink.query_links?src_doc_type=STANDARDS&src_unique_file=1926_0701&src_anchor_name=1926.701(b)**REINFORCING STEEL SAFETY:** (OSHA 1926.701 (b)):
All protruding reinforcing steel, onto and into which employees could fall, shall be guarded to eliminate the hazard of impalement.

**STRUCTURAL STEEL SAFETY:** (OSHA 1926.754 (c)(l)(i)):
Shear connectors, reinforcing bars, etc. shall not be attached to the top flanges of beams so that they project vertically from or horizontally across the top flange until after another walking/working surface has been installed.

**UTILITY SAFETY:** (OSHA 1910.333 (c)(3)(i)(A); 1910.333 (c)(3)(i)(B)):
When an "unqualified" person is working in an elevated position near overhead lines or on the ground in the vicinity of overhead lines, the location shall be such that the person and the longest conductive object he or she may contact cannot come closer to any unguarded, energized overhead line than the following distances:

1. For voltages to ground 50kV or below - **10 feet** (305 cm);
2. For voltages to ground over 50kV - **10 feet** (305 cm) **plus 4 inches** (10 cm) **for every 10kV over 50kV.**

Note: An "unqualified" person is anyone that does not work for a utility company.

**UTILITY SAFETY:** (OSHA 1910.333 (c)(3)(iii)(A)):
Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated so that a **clearance of 10 ft.** (305 cm) is maintained. If the voltage is higher than 50kV, the clearance shall be increased 4 in. (10 cm) for every 10kV over that voltage. However, under any of the following conditions, the clearance may be reduced:

1. If the vehicle is in transit with its structure lowered, the clearance may be reduced to 4 ft. (122 cm). If the voltage is higher than 50kV, the clearance shall be increased 4 in. (10 cm) for every 10 kV over that voltage.
2. If insulating barriers are installed to prevent contact with the lines, and if the barriers are rated for the voltage of the line being guarded and are not a part of or an attachment to the the vehicle or its raised structure, the clearance may be reduced to a distance within the designed working dimensions of the insulating barrier.

**WATER SAFETY:** (OSHA 1926.106 (a)):
Employees working over or near water, where the danger of drowning exists, shall be provided with U.S. Coast Guard-approved **life jacket** or buoyant work vests.

**WATER SAFETY:** (OSHA 1926.106 (c)):
**Ring buoys** with at least 90 feet of line shall be provided and readily available for emergency rescue operations. Distance between ring buoys shall not exceed 200 feet.

http://www.osha-slc.gov/pls/oshaweb/owalink.query_links?src_doc_type=STANDARDS&src_unique_file=1926_0106&src_anchor_name=1926.106(d)**WATER SAFETY:** (OSHA 1926.106 (d)):
At least **one lifesaving skiff** shall be immediately available at locations where employees are working over or adjacent to water.

# DRIVEWAY STATUTE:

(SOURCE: http://www.gencourt.state.nh.us/rsa/html/XX/236/236-13.htm )

RSA 236:13 Driveways and Other Accesses to the Public Way

I. It shall be unlawful to construct, or alter in any way that substantially affects the size or grade of, any driveway, entrance, exit, or approach within the limits of the right-of-way of any class I or class III highway or the state maintained portion of a class II highway that does not conform to the terms and specifications of a written permit issued by the commissioner of transportation (Amended 1985, 402:6, I(b)(7)).

II. Pursuant to this section, a written construction permit application must be obtained from and filed with the department of transportation by any abutter affected by the provisions of paragraph I. Before any construction or alteration work is commenced; said permit application shall have been reviewed, and a construction permit issued by said department. Said permit shall:

(a) Describe the location of the driveway, entrance, exit, or approach. The location shall be selected to most adequately protect the safety of the traveling public.
(b) Describe any drainage structures, traffic control devices, and channelization islands to be installed by the abutter.
(c) Establish grades that adequately protect and promote highway drainage and permit a safe and controlled approach to the highway in all seasons of the year.
(d) Include any other terms and specifications necessary for the safety of the traveling public (Amended 1985, 402:6, I(a)(7)).

III. For access to a proposed commercial or industrial enterprise, or to a subdivision, all of which for the purposes of this section shall be considered a single parcel of land, even though acquired by more than one conveyance or held nominally by more than one owner:

(a) Said permit application shall be accompanied by engineering drawings showing information as set forth in paragraph II.
(b) Unless all season safe sight distance of 400 feet in both directions along the highway can be obtained, the commissioner shall not permit more than one access to a single parcel of land and this access shall be at that location which the commissioner determines to be safest. The commissioner shall not give final approval for use of any additional access until it has been proven to him[her] that the 400 foot all season safe sight distance has been provided.
(c) For the purposes of this section, all season safe sight distance is defined as a line which encounters no visual obstruction between 2 points, each at a height of 3 feet 9 inches above the pavement, and so located as to represent the critical line of sight between the operator of a vehicle using the access and the operator of a vehicle approaching from either direction.

IV. No construction permit shall allow:

(a) A driveway, entrance, exit, or approach to be constructed more than 50 feet in width, except that a driveway, entrance, exit, or approach may be flared beyond a width of 50 feet at its junction with the highway to accommodate the turning radius of vehicles expected to use the particular driveway, entrance, exit or approach.
(b) More than 2 driveways, entrances, exits or approaches from any one highway to any one parcel of land unless the frontage along the highway exceeds 500 feet.

V. The same powers concerning highways under their jurisdiction as are conferred upon the commissioner of transportation by paragraphs I, II, III and IV, shall be conferred upon the planning board in cities and towns wherein the planning board has been granted the power to regulate the subdivision of land as provided in RSA 674:35 and, they shall adopt such regulations as are necessary to carry out the provisions of this section (Amended 1985, 103:4, effective Jan. 1, 1986; 402:6, I(b)(7)).

RSA 236:14 Penalty. Any person who violates any provision of this subdivision or the rules and regulations made under authority thereof shall be guilty of a violation if a natural person, or guilty of a misdemeanor if any other person; and, in addition, shall be liable for the cost of restoration of the highway to a condition satisfactory to the person empowered to give such written permission.

## JURISDICTION STATUTES:

(SOURCE: http://www.gencourt.state.nh.us/rsa/html/indexes/XX.html )
(SOURCE: Also see bottom of next page)

Three statutes, RSA 228:21, 228:37, and 236:1, establish the D.O.T. commissioner's jurisdiction and authority over construction zone traffic control.

**228:21 Powers. –** I. "The commissioner shall exercise general supervision, control and direction, on behalf of the state, over all matters pertaining to the location, route, alteration, construction, reconstruction, maintenance and discontinuance of highways constructed…"

**228:37 Closing Highways; Detours; Penalty –** "The commissioner may close, regulate or restrict traffic over any section of class I, II or class III highway or bridge thereon when the public welfare or necessity so requires, or in order to perform work on any such highway or bridge by posting notices at each end of such section of highway…"

**236:1 Regulation. –** I. The commissioner may regulate the use of class I, class II, and class III highways in towns or cities without compact sections and in other towns and cities outside the compact portion thereof as determined by him, including the use of rights-of-way.

Flaggers and law enforcement personnel, when used as a means to direct traffic within the construction zone, fall within the Commissioner's authority. In exercising his/her traffic control authority, the Commissioner has adopted the MUTCD, a set of national guidelines published under the auspices of the US Department of Transportation, Federal Highway Administration. The purpose of the MUTCD is to provide uniform and systematic treatment of highway conditions, including construction zones, on a nationwide basis. Such consistency has been found to be central to motorist safety. Application of the MUTCD's principles requires familiarity with its widely accepted traffic engineering principles and doctrines. Proper utilization of its guidelines is crucial to meeting driver expectation on a statewide and national basis. The loss of consistency and uniformity can be highly dangerous. The need to unify traffic engineering under the Department of Transportation is one of the reasons why the legislature has established the above statutes.

Since any potential liability for state maintained roads rests with the Department pursuant to RSA 230:78, et seq., interference with the established traffic control plan should be regarded seriously.

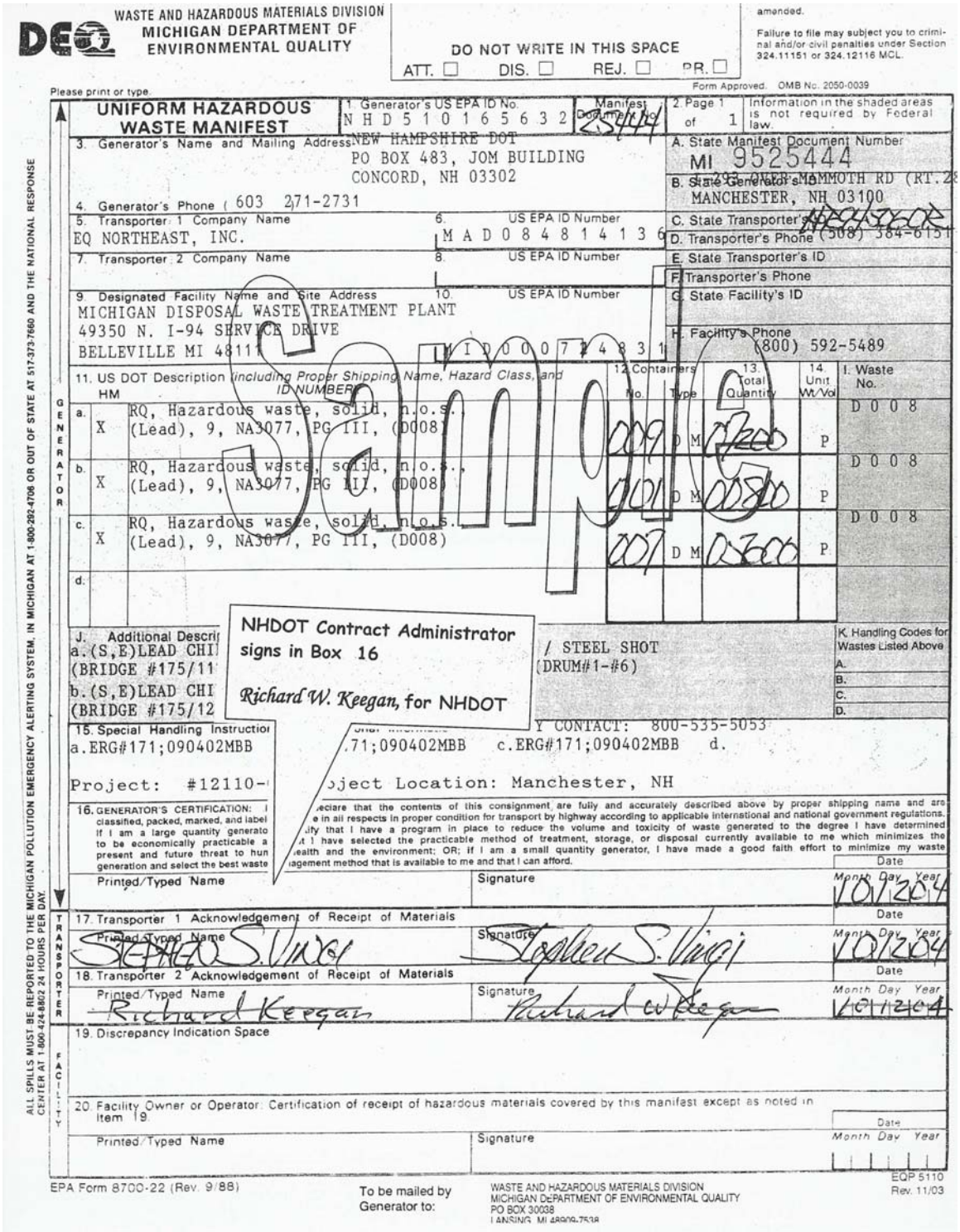
The state police have the requisite police power granted to them by the General Court per RSA 106-B:12. State police employees have state-wide jurisdiction to patrol the highways and enforce highway

traffic and motor vehicle laws, in addition to the general power to enforce all criminal laws of the state. County sheriff's deputies have statewide jurisdiction per RSA 104:6. In order to minimize competition and friction between state and local police forces, RSA 106-B:15 was written limiting state police jurisdiction. If possible and in the best interest of the traveling public, the boundaries set forth by RSA 106-B:15 should be honored. However, if the Department of Transportation so elects, it may legally establish a contractual preference requiring the use of state police employees on all state highway projects, including those located in cities or towns with populations exceeding 3,000 people. The need to provide guidance to contractors, administrative convenience or comity between state agencies are all sufficient to justify a requirement that state police employees be recognized as the primary source for uniformed traffic control officers on the job.

> **106-B:12 Authority and Duties of Police Employees. –** "[State] police employees shall be ex-officiis constables throughout the state, shall patrol the highways, enforce the highway traffic laws and regulations, enforce the motor vehicle laws relative thereto… [State] police employees shall have general power to enforce all criminal laws of the state and to serve criminal processes and make arrests, under proper warrants, in all counties…"
>
> **106-B:15 Jurisdiction of Police Employees. –** "[State] police employees have jurisdiction on all turnpikes, toll roads and interstate highways and nothing in this section shall be construed to limit the authority of local police officers. A [state] police employee shall not act within the limits of a town having a population of more than 3,000 or of any city, **except** when he witnesses a crime, or is in pursuit of a law violator or suspected violator, or when in search of a person wanted for a crime committed outside its limits, or when in search of a witness of such crime, or when traveling through such town or city, or when acting as an agent of the director of motor vehicles enforcing rules pertaining to driver licenses, registrations and the inspection of motor vehicles, or when requested to act by an official of another law enforcement agency, or when ordered by the governor…"
>
> **104:6 Powers. –** Sheriffs and their deputies shall have throughout the state the same power and authority to serve criminal or civil processes, investigate crimes and to pursue and apprehend criminals that they have in their respective counties.

ADDITIONAL SOURCE INFORMATION:
The above information is based on two opinion documents written individually on December 11, 1995 by Senior Assistant Attorney General Michael Walls (Use of Uniformed Officers on Construction Projects) and on December 30, 1996 by Senior Assistant Attorney General Mark Hodgdon (Nottingham Project 11144, Jurisdiction over Traffic Control).

# HAZARDOUS WASTE MANIFEST:



WASTE AND HAZARDOUS MATERIALS DIVISION
MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

DO NOT WRITE IN THIS SPACE
ATT. ☐ DIS. ☐ REJ. ☐ PR. ☐

amended.
Failure to file may subject you to criminal and/or civil penalties under Section 324.11151 or 324.12116 MCL.

Form Approved. OMB No. 2050-0039

Please print or type.

**UNIFORM HAZARDOUS WASTE MANIFEST**

1. Generator's US EPA ID No. N H D 5 1 0 1 6 5 6 3 2 — Manifest Document No. 25444 — 2. Page 1 of 1 — Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address: NEW HAMPSHIRE DOT, PO BOX 483, JOM BUILDING, CONCORD, NH 03302

A. State Manifest Document Number: MI 9525444

B. State Generator's ID: 20 [illegible] MAMMOTH RD (RT.2[illegible] MANCHESTER, NH 03100

4. Generator's Phone ( 603 ) 271-2731

5. Transporter 1 Company Name: EQ NORTHEAST, INC. — 6. US EPA ID Number: M A D 0 8 4 8 1 4 1 3 6 — C. State Transporter's ID: [illegible] — D. Transporter's Phone: (508) 384-6151

7. Transporter 2 Company Name — 8. US EPA ID Number — E. State Transporter's ID — F. Transporter's Phone

9. Designated Facility Name and Site Address: MICHIGAN DISPOSAL WASTE TREATMENT PLANT, 49350 N. I-94 SERVICE DRIVE, BELLEVILLE MI 48111 — 10. US EPA ID Number: M I D 0 0 0 7 2 4 8 3 1 — G. State Facility's ID — H. Facility's Phone: (800) 592-5489

| | 11. US DOT Description (including Proper Shipping Name, Hazard Class, and ID NUMBER) | HM | 12. Containers No. | Type | 13. Total Quantity | 14. Unit Wt/Vol | I. Waste No. |
|---|---|---|---|---|---|---|---|
| a. | RQ, Hazardous waste, solid, n.o.s., (Lead), 9, NA3077, PG III, (D008) | X | 009 | D M | 4500 | P | D 0 0 8 |
| b. | RQ, Hazardous waste, solid, n.o.s., (Lead), 9, NA3077, PG III, (D008) | X | 001 | D M | 0500 | P | D 0 0 8 |
| c. | RQ, Hazardous waste, solid, n.o.s. (Lead), 9, NA3077, PG III, (D008) | X | 007 | D M | 0500 | P | D 0 0 8 |
| d. | | | | | | | |

NHDOT Contract Administrator signs in Box 16

*Richard W. Keegan, for NHDOT*

J. Additional Descri
a. (S,E)LEAD CHI / STEEL SHOT
(BRIDGE #175/11 (DRUM#1-#6)
b. (S,E)LEAD CHI
(BRIDGE #175/12

K. Handling Codes for Wastes Listed Above: A. B. C. D.

15. Special Handling Instructio
a. ERG#171;090402MBB [illegible] Y CONTACT: 800-535-5053
[illegible].71;090402MBB c. ERG#171;090402MBB d.

Project: #12110-[illegible] oject Location: Manchester, NH

16. GENERATOR'S CERTIFICATION: I [illegible]eclare that the contents of this consignment are fully and accurately described above by proper shipping name and are [illegible]e in all respects in proper condition for transport by highway according to applicable international and national government regulations. If I am a large quantity generato [illegible]ify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable a [illegible]t I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to hun [illegible]ealth and the environment; OR; if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste [illegible]agement method that is available to me and that I can afford.

Printed/Typed Name — Signature — Date: Month Day Year 10/12/04

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name: STEPHEN S. VINCI — Signature: Stephen S. Vinci — Date: Month Day Year 10/12/04

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name: Richard Keegan — Signature: Richard W Keegan — Date: Month Day Year 10/12/04

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name — Signature — Date: Month Day Year

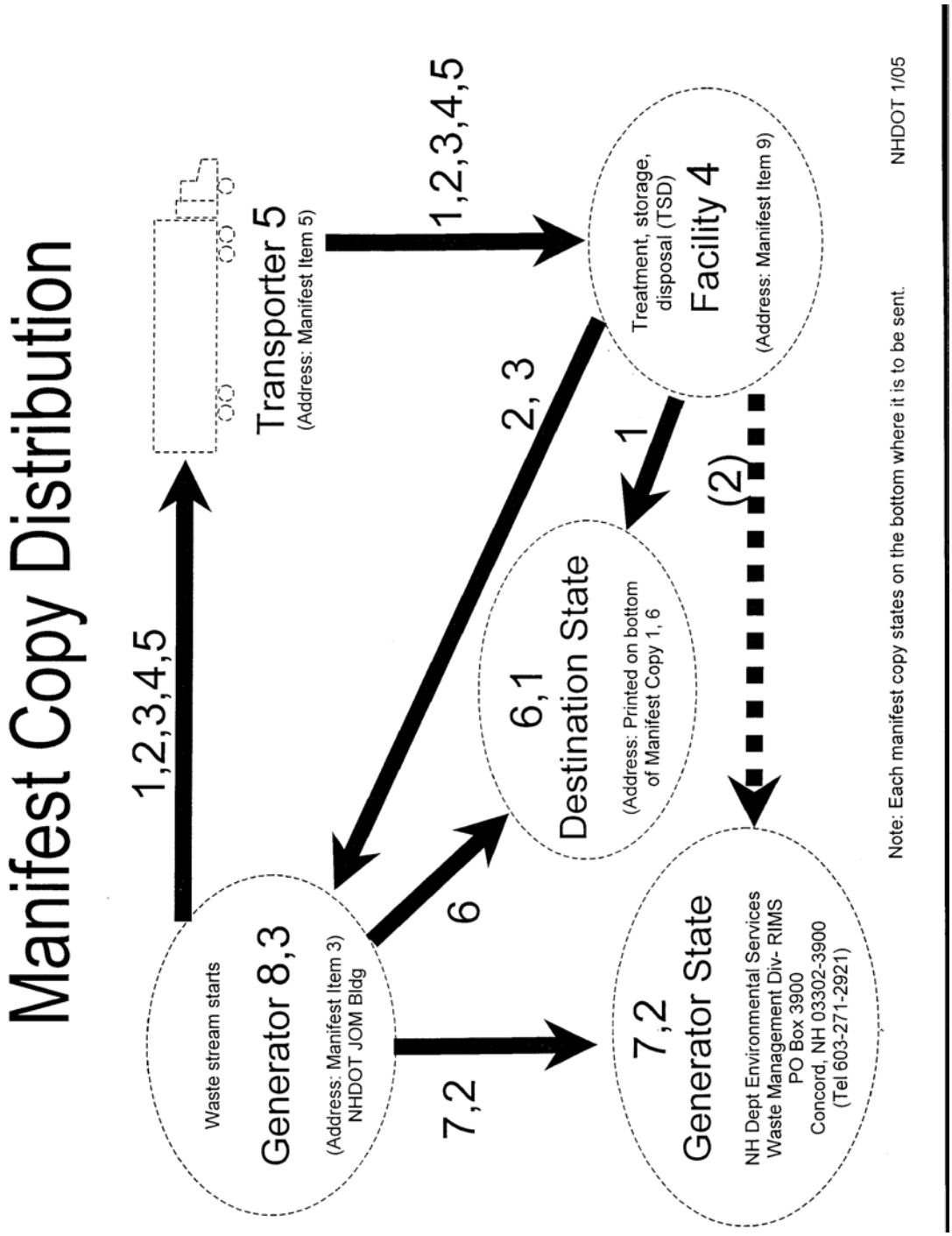
GENERATOR — TRANSPORTER — FACILITY

ALL SPILLS MUST BE REPORTED TO THE MICHIGAN POLLUTION EMERGENCY ALERTING SYSTEM. IN MICHIGAN AT 1-800-292-4706 OR OUT OF STATE AT 517-373-7660 AND THE NATIONAL RESPONSE CENTER AT 1-800-424-8802 24 HOURS PER DAY.

EPA Form 8700-22 (Rev. 9/88) — To be mailed by Generator to: WASTE AND HAZARDOUS MATERIALS DIVISION, MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY, PO BOX 30038, LANSING, MI 48909-7538 — EQP 5110 Rev. 11/03

**HAZARDOUS WASTE MANIFEST (Continued):**

(SOURCE: NHDOT Construction Manual, 1998 Metric Revision)



# FUEL DISTRIBUTION - FUELING SITE LOCATION LIST:

(SOURCE: Bureau of Mechanical Services)
(SOURCE: S:\Word\Docs\FuelDistFormTemplates\FuelingSiteLocationMap.doc)

## All Locations have Unleaded & Diesel Fuel

**CHARLESTOWN:** On NH Rte 12, 1/2 mile north of the center of town at NH DOT shed.
**COLUMBIA:** On US Rte 3, 2 miles south of the Columbia/Colebrook town line at NH DOT shed.
**CONCORD:** On Stickney Ave. in the north parking lot for the highway garage, near I-93 Exit 14.
**CONWAY:** On NH Rte 112 (Kancamangus Highway), 1/2 mile east of NH Rte 16 at NH DOT shed.
**DERRY:** Off Kendall Pond Rd., via Gilcrest Rd. & NH Rte 102, near Exit 4, I-93 at NH DOT shed.
**DOVER:** At Exit 9, Spaulding Turnpike at NH DOT shed near Week's Circle.
**DURHAM:** At the maintenance garage, off NH Rte 155, 1/4 mile south of Rte 4 and Rte 155 inter.
**ENFIELD:** Off I-89 at Exit 16 first drive on right at NH DOT District #2 headquarters.
**EPPING:** Off NH Rte 125 at the junction of Old Hedding Road next to NH State Police Troop A.
**GILFORD:** At the inter. of NH Rte 11 & Rte 11-C at the east end of the bypass near Lily Pond.
**GORHAM:** Off US Rte 2, 1 mile west of NH Rte 16 at the base of the hill at NH DOT shed.
**HAMPTON:** Off I-95, 1/4 mile south of the Hampton toll booths on the south-bound side.
**HILLSBORO:** On NH Rte 9, 1/4 mile west of the inter. of NH Rte 31 at NH DOT shed.
**HOOKSETT:** On the entrance road to Dist. #5 & Turnpike Bureau hdqtrs. near Hooksett Toll Plaza
**LANCASTER:** On US Rte 3, 4 miles north of Lancaster at NH DOT District #1 headquarters.
**LINCOLN:** At the end of Bern Dibner Road, behind Clark's Trained Bears at NH DOT shed.
**LITTLETON:** On Dell Rd., off US Rte 302, 1/10 mile east of I-93, Exit 42, behind N.G. Armory.
**MANCHESTER:** NH Rte 101 east, 1/2 mile east of the inter. of I-93, or ½ mile west of Exit 1.
**MERRIMACK:** On NH Rte 3, 1/2 mile south of Exit 11 near Budweiser Plant.
**MILFORD:** At the end of Buxton Rd. off NH Rte 13, 1 mile north of the circle at NH DOT shed.
**MILTON:** On NH Rte 16, 1/10 mile south of the inter. of Rte. 16 and Rte. 75 at NH DOT shed.
**NEW HAMPTON:** Off the north side of NH Rte 104, 1/4 mile east of I-93 Exit 23 at NH DOT shed.
**NO. HAMPTON:** On South Road, ¼ mile south of NH Rte 101-D or 2 miles west of US Rte 1 at the NH DOT satellite garage.
**NO.HAVERHILL:** On NH Rte 10, north of Haverhill Village near the County Court House at NH DOT shed.
**PITTSFIELD:** On NH Rte 107, 1/10 mile south of the intersection of NH Rte 28 at NH DOT shed.
**RINDGE:** On NH Rte 119, 3 miles west of Rindge near Rindge/Fitzwilliam town line at NH DOT shed.
**SUNAPEE:** At the inter. of NH Rte 11 and NH Rte 103 in the village of Wendell at NH DOT shed.
**SWANZEY:** On Base Hill Rd, off NH Rte 10, 3 miles south of the inter. of Rte 101 at District #4.
**TAMWORTH:** On NH Rte 16, 1/2 mile north of the inter. of NH Rte 25 at NH State Police Troop E.
**THORNTON:** On the road to Thornton Laundromat, off Rte3, 1/2 mile north of I-93 Exit 29 at NH DOT shed.
**TWIN MT:** On US Rte 302, 1 mile west of the inter. of US Rte 3 across from State Police Troop F.
**WARNER:** Off NH Rte 103 first road 1/10 mile east of I-89 Exit 7 at NH DOT shed.
**WENTWORTH:** Off NH Rte 25 at the Wentworth/Warren town line, ½ mile south on side road at NH DOT shed.

**Concord also has Compressed Natural Gas Available**

# FUEL DISTRIBUTION - USER GUIDE:

**N.H.D.O.T.**
**Fuel Distribution Section**
Stickney Avenue
Concord, NH 03301
Tel. (603) 271-2056
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This equipment will provide fuel for authorized users 24 hours a day, 7 days a week. If you cannot obtain fuel please contact the Site Manager at the fueling location, or call the Fuel Distribution Section in Concord, N.H. telephone (603) 271-2056

**``````````OPERATING INSTRUCTIONS``````````**

**1.** Approach the Ward automated fueling terminal. The display must read **"INSERT CARD"** to start a fueling transaction. If it doesn't, press **"START OVER."** If no message appears, the system is not working and cannot be used.

**2.** Slide the **"DRIVER CARD"** through the card reader in one swift motion. The display will respond **"INSERT 2ND CARD."** Slide the **"VEHICLE CARD"** through the card reader in the same manner as above.

**3.** The fuel terminal will respond with the word **"ODOMETER,"** enter the odometer reading from your vehicle through the numeric touch pad. When the odometer is correct (to the nearest mile) press **"ENTER."**

**4.** Now the terminal will respond with **"SELECT PUMP."** Enter the pump number that corresponds with the fuel type your vehicle uses through the touch pad, then press "**ENTER."**

**5.** Go to the pump you have selected, remove the hose nozzle, turn the reset handle counter-clockwise to the **"ON"** position. Pump the required fuel, turn the reset handle clockwise to the **"OFF"** position and place the hose nozzle back in its resting place. You should have had a successful fueling of your vehicle. Be sure to close the gas cap on your car.

If you have problems, repeat steps 2 thru 5, or contact the Site Manager at your location. It could be card problems, operation problems, or the system may not be working.